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# An Annotated List of Grasshoppers (Orthoptera, Acrididae) from the Eleven Panhandle Counties of Nebraska

A. F. Hagen

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**Research Bulletin**

**238**

**April 1970**

**An Annotated List  
of Grasshoppers  
(Orthoptera, Acrididae)  
From the Eleven  
Panhandle Counties  
of Nebraska**

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**A. F. Hagen**

**University of Nebraska  
College of Agriculture and Home Economics  
The Agricultural Experiment Station  
E. F. Frolik, Dean                      H. W. Ottoson, Director**





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## SUMMARY

A description of the study area is presented indicating the ecological niches that exist in the Nebraska Panhandle. Seventy-five species of grasshoppers are listed from the 11 Panhandle counties. Twenty-one occur in the subfamily Acridinae, 29 in Oedipodinae, 24 in Cyrtacanthacridinae and 1 in Romaleinae. Ecological, taxonomic and distributional data are presented.

# **An Annotated List of Grasshoppers (Orthoptera, Acrididae) From the Eleven Panhandle Counties of Nebraska**

Arthur F. Hagen<sup>1</sup>

## **INTRODUCTION**

This seven-year study began in 1962. Its purpose was to determine the species and distribution of Acrididae in the 11 Panhandle counties of Nebraska. During the study, grasshopper populations increased. As a result, a large series of specimens of most species was collected which aided in solving some of the taxonomic problems encountered in the study.

Specimens examined were those collected during the study or on loan from the University of Nebraska Museum. This latter group included those reported from the Panhandle by Hauke (1953). Some specimens from the Panhandle are in other museums and in private collections. These are not listed but may be mentioned in comments on the species.

Many specimens examined that were collected before this study were incorrectly identified. These misidentifications were corrected. Generic and specific names of some of the species have been placed in synonymy since they were identified. These have been corrected so that all generic and specific names used in the text are those of current usage.

Acrididae consists of four subfamilies; Acridinae, Oedipodinae, Romaleinae and Cyrtacanthacridinae. Orthoptera taxonomists are now concerned about the validity of separating the Acridinae and Oedipodinae (Uvarov, 1942), (Dirsh, 1950) and (Rehn and Grant, 1960). They state that some genera will fit into either subfamily on the basis of morphological characters now used to separate the two subfamilies. They also suggest various solutions to the problem such as the absence

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<sup>1</sup> Asst. Prof. of Entomology, Scotts Bluff Sta., Mitchell, Nebr. Contribution from North Central Regional Project NC-52. Factors influencing the distribution and abundance of grasshoppers.

or presence of denticles on the internal carina of the caudal femora or of various veination patterns on the tegmina.

No definite decision has been made concerning this problem; therefore, the subfamilies Acridinae and Oedipodinae are retained in this report. White (1949) indicated that cytological studies would be helpful in solving some of the taxonomic problems. He separated the genus *Trimerotropis* into two groups based on the shape of the chromosomes. Carothers (1917), Helwig (1929, 1955), Coleman (1948) and others have used cytogenetics to investigate the taxonomy of grasshoppers. I encountered some problems in this investigation where it was felt cytogenetic studies would be helpful in solving them. This has been indicated in the description of the species involved.

Much has been written on the descriptions of the species by Hebard (1925, 1928, 1929, 1931), Ball, *et al.* (1942), Brooks (1958), Coppock (1962), Hewitt and Barr (1967) and others. Descriptions are used in this report only when necessary to clarify a problem encountered in the study. References are also made on the ecology of some of the species when needed to clarify the distribution of that species.

The Nebraska Panhandle is described to familiarize the reader with habitats that exist in the area.

The writer wishes to acknowledge with grateful thanks the assistance of Dr. Ashley B. Gurney of the Systematic Entomology Laboratory USDA (at the U.S. National Museum) for his valuable aid in identifying some of the species. In addition, his help in solving some of the systematic problems that arose during the study is gratefully appreciated. A special thanks to Dr. Herbert Wallace of Northeast Louisiana State College who resolved the *Hesperotettix* subspecies problem.

## DESCRIPTION OF THE NEBRASKA PANHANDLE

The Nebraska Panhandle contains about nine million acres of land comprising about five million acres of rangeland, three and a half million acres of cropland and the rest either woodland or badlands.

The principal grasses in the rangeland in the eastern portion of the Panhandle are sand bluestem *Andropogon halli* Hack., little bluestem *Andropogon scoparius* Michx., and prairie sandreed *Calamovilfa longifolia* (Hook) Scribn. Westward these are replaced by blue grama *Bouteloua gracilis* (HBK) Lag., and needle-and-thread *Stipa comata* Trin. & Rupr. Cacti, sagebrush *Artemisia* sp. and other weedy forbs grow intermingled among the grasses in the entire rangeland area. These are usually found where some physical injury has occurred to the grasses and in areas of poor soil. Sedges *Carex* sp. grow abundantly in the low moist areas.

The cropland includes about one-half million acres of irrigated land, planted to corn, sugarbeets, field beans, potatoes, alfalfa and some small grain. The remaining dryland cropland acreage grows mostly wheat in a wheat-fallow system.

A few of the other crops listed for irrigated lands are also grown occasionally on dry land. The average precipitation in the Panhandle is about 14 inches. Elevations range from 3,000 feet to 5,424 feet above sea level.

Kuchler (1964) described vegetative units which included the Nebraska Panhandle. He based these units on the supposition that man was not present, and this would be the vegetation at the present time under this condition. In some areas of the Panhandle, although man is present, he has not influenced the vegetation. The vegetation in these areas is as Kuchler described it. Where cultivation has taken place, however, the vegetation is constantly changing. Kuchler's vegetative units are as follows (Figure 1).

## **Wheatgrass-Needlegrass**

Moderately dense, short or medium tall grassland. Dominant grasses are: western wheatgrass *Agropyron smithii* Rydb., blue grama and needle-and-thread grass.

Within this area in the Panhandle occur lands so severely eroded that little vegetation is present. These are known as the Nebraska Badlands. The northern portion of Sioux and Dawes Counties and the northwestern portion of Sheridan County comprise this vegetative unit in the Panhandle.

## **Eastern Ponderosa Forest**

Medium dense to open forest of low to medium tall needleleaf evergreen trees with a fairly open ground cover of grasses. The dominant tree species is Ponderosa Pine *Pinus ponderosa* Laws. The ground cover of grasses is composed of western wheatgrass, blue grama and needle-and-thread grass.

This vegetative unit in the Panhandle is represented by the Pine Ridge and the Wildcat Hills. The Pine Ridge is in Sioux, Dawes and Sheridan Counties. It is characterized, in addition to the presence of evergreen trees, by steep slopes, cliffs, deeply eroded canyons and some tableland. The Wildcat Hills are on the border between Scotts Bluff and Banner Counties. Their characteristics are similar to Pine Ridge. Although Kuchler does not indicate it, a small similar area extends into west central Kimball County from Wyoming. This area in Wyoming is known as Pine Bluffs which is the type locality of *Trimerotropis fratercula* McNeill.

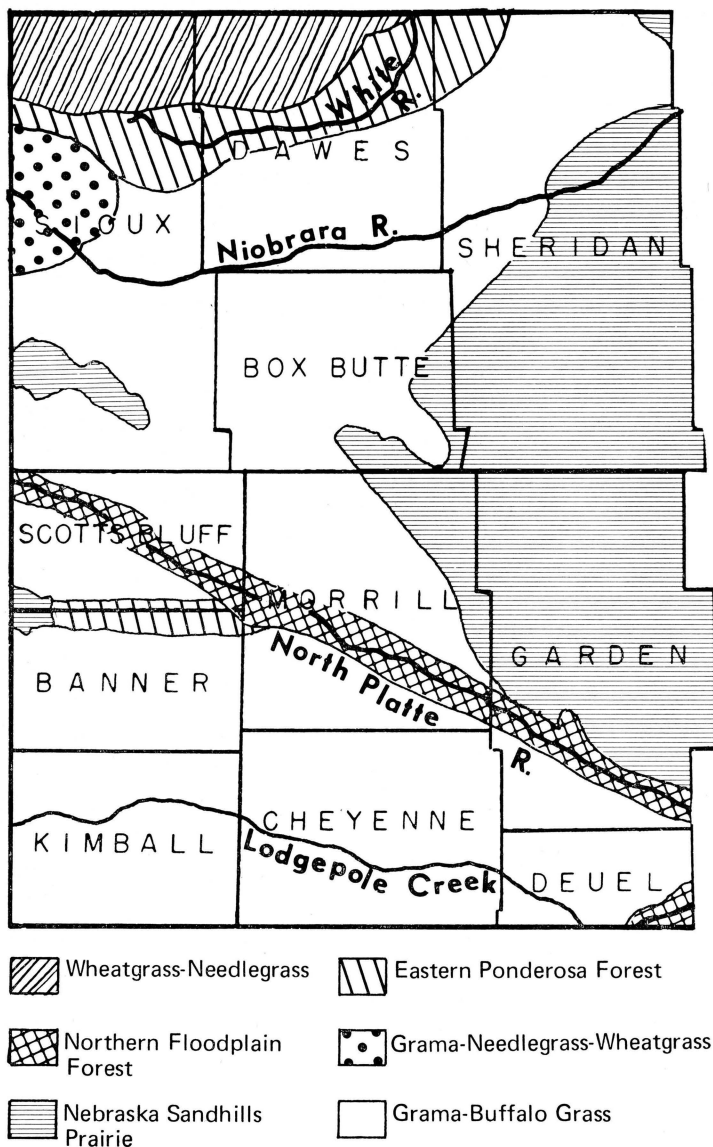


Figure 1. Vegetative units in the Nebraska Panhandle.

## Nebraska Sandhills Prairie

Medium dense to open grassland, medium tall to tall. The dominant grasses are big bluestem *Andropogon gerardi* Vitman., sand bluestem, little bluestem and prairie sandreed.

In eroded areas, these are replaced by weedy forbs *Artemisia* sp. and others.

The southern two-thirds of Sheridan County, the northern half of Garden County, the northeastern corner of Morrill County, small areas of south central Sioux County and southwestern Scotts Bluff County are included in this vegetative unit.

## Grama-Needlegrass-Wheatgrass

Rather short, open to fairly dense grass. Dominant grasses are western wheatgrass, blue grama and needle-and-thread grass.

This vegetative unit in the Nebraska Panhandle is represented by a small area in west central Sioux County.

## Northern Flood Plain Forest

Low to tall broadleaf deciduous forest, open to dense, often with lianas. The dominant tree species present are: Cottonwood *Populus deltoides* Bartr., Black Willow *Salix nigra* Marsh and American Elm *Ulmus americana* L. This vegetative unit shows a slight influence of man by the presence of Russian olive *Elaeagnus angustifolia* L. This species was brought into the Panhandle as a shelterbelt tree. It has escaped to the river valleys and at present is competing with some of the natural occurring species.

The main area represented by this vegetative unit in the Panhandle is the North Platte River which flows through the counties of Scotts Bluff, Morrill and Garden. Although Kuchler does not show it in his description, small, intermittent areas along Lodgepole Creek through Kimball, Cheyenne and Deuel Counties and along the White River in Sioux and Dawes Counties have vegetation typical of this unit. This is also true of some of the smaller creeks that drain into these larger drainages. Two drainages which do not have this bordering vegetation are Pumpkin Creek and the Niobrara River. The latter is represented by this vegetative unit farther east in Nebraska. In the extreme southeastern portion of Deuel County, the vegetation of this unit occurs along the South Platte River.

## Grama-Buffalo Grass

Fairly dense grassland of short grass with somewhat taller grasses in the eastern sections. Dominant grasses are blue grama and buffalo grass *Buchloe dactyloides* (Nutt.) Engelm.



This unit comprises the largest portion of the Nebraska Panhandle. It also represents the unit in which most of the cultivated land occurs, therefore, quite often differs greatly from Kuchler's descriptions. The area in Scotts Bluff, Morrill, Garden and south Sioux Counties on either side of the North Platte River are surface irrigated croplands. This is also true in the central portion of Box Butte County. Some areas of dryland cropping occur in north central Sioux, Dawes and Sheridan Counties. The counties of Kimball, Cheyenne, Deuel and southern Banner are almost entirely under a wheat-fallow system. Only in areas not suitable for cultivation does the vegetation described for this unit occur.

These six vegetative units in the Panhandle represent numerous habitats, which probably accounts for the large number of grasshopper species present.

## SUBFAMILY ACRIDINAE

### *Pseudopomala brachyptera* (Scudder)

*Opomala brachyptera* Scudder, 1862:454—Hauke (1953) states, "This species appears to be very scarce in Nebraska." No specimens from the Panhandle were in the collection he examined. I collected 13 specimens from seven of the Panhandle counties during the current study. The specimens collected in the northern Panhandle were in tall grass at the edge of pine forests. A permanent or intermittent stream was associated with all collection sites. In addition, one of the blue-stem or wheat grasses was usually present. Morse (1920) reports an occasional long-winged form. All specimens examined in this study are brachypterous. The wings on the female extend to the second abdominal segment, while those on the male extend almost to the fifth abdominal segment.

This species appears to exhibit a form of protective coloration, changing from green to brown in relation to color changes in grasses it inhabits. They are very inactive and prefer to cling to the grass blades even when disturbed. These features make them difficult to see and probably aid in survival of the species.

Specimens Examined: *Banner County*, Harrisburg, Aug. 23, 1967, (A. F. Hagen), 2 ♀ ♀. *Dawes County*, Crawford, Aug. 29, 1967, (A. F. Hagen), 1 ♀. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Morrill County*, Bridgeport, Aug. 21, 1967, (A. F. Hagen), 1 ♂. *Scotts Bluff County*, Gering, Aug. 30, 1967, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Sheridan County*, Rushville, Aug. 29, 1967, (A. F. Hagen), 1 ♂, 1 ♀. *Sioux County*, Harrison, Aug. 29, 1967, (A. F. Hagen), 1 ♂.

## *Parapomala wyomingensis* (Thomas)

*Opomala wyomingensis* Thomas, 1871:446—Bruner (1889) described this grasshopper as *Mesops cylindricus* *sp nov* from specimens collected at Valentine, Cherry County, and Chadron, Dawes County, Nebraska. Specimens are in the collection from all Panhandle counties except Cheyenne and Kimball. It is found where tall grasses grow in swales and moist areas. Suitable habitats exist in Cheyenne and Kimball Counties, so it may occur there. Its resemblance in coloration to the grass aids in concealment and it does not become active when disturbed.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂, 4 ♀♀. *Box Butte County*, Box Butte, September, 1 ♀. *Dawes County*, Crawford, Aug. 29, 1967, (A. F. Hagen), 2 ♀♀. *Deuel County*, Big Springs, July 29, 1932, (H. C. Jones), 1 ♂, 2 ♀♀. *Garden County*, Island Lake, Sept. 3, 1954, (E. W. Hamilton), 1 ♂, 1 ♀. *Morrill County*, Bridgeport, Aug. 21, 1967, (A. F. Hagen), 1 ♂, 1 ♀. *Scotts Bluff County*, Gering, Aug. 10, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Sheridan County*, Lakeside, Sept. 3, 1954, (E. W. Hamilton), 1 ♂. *Sioux County*, Harrison, Aug. 24, 1966, (A. F. Hagen), 2 ♂♂, 2 ♀♀.

## *Mermiria neomexicana* (Thomas)

*Opomala neomexicana* Thomas, 1870:77—This species is rare in the Panhandle. Specimens were found in only two counties. Bruner (1893, 1897) recorded it as being "abundant in middle and western regions where it frequents rather high grounds in preference to low grounds." A female in the collection labeled *M. neomexicana*, Sioux County, Glen, August, 1905 appears to be *M. maculipennis macclungi* Rehn. Most keys separate the two species by the presence (*M. maculipennis macclungi*) or the absence (*M. neomexicana*) of a white or yellowish bar on the subcostal region of the tegmina. Specimens of the two species in the collection exhibit another difference. The median carina of the pronotum in *M. neomexicana* is colored a dark brown while *M. maculipennis macclungi* lacks this coloration.

Specimens Examined: *Cheyenne County*, Sidney, Aug. 31, 1964, (A. F. Hagen), 1 ♂, 2 ♀♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 1 ♀.

## *Mermiria maculipennis macclungi* Rehn

*Mermiria maculipennis macclungi* Rehn, 1919:111—Rehn (1919) recorded specimens of this species from Cheyenne and Sioux Counties. During the current study, it was collected in all the remaining Panhandle counties. Like the preceding species, *M. neomexicana*, this spe-

cies is usually found in rangeland in areas of tall grasses such as *Calamovilfa longifolia* (Hook) Scribn. These are quite often low areas where water collected and caused a rank growth of the grasses. It is also found in tall grass areas at the edge of pine forests.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♂, and Aug. 5, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♀. Hemingford, Aug. 16, 1966, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, Aug. 31, 1964, 1 ♂, 1 ♀, and Aug. 22, 1966, 1 ♀, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 1 ♀. Ft. Robinson, Sept. 5, 1962, 1 ♀. Crawford, July 31, 1962, 1 ♂, 1 ♀, and July 15, 1964, 1 ♂, (A. F. Hagen). *Deuel County*, Chappell, Sept. 2, 1964, 1 ♀, and Aug. 22, 1967, 1 ♂, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Kimball County*, Kimball, Aug. 31, 1964, (A. C. Scoggan), 1 ♀; Aug. 31, 1964, (A. F. Hagen), 1 ♀. *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 2 ♂♂. *Scotts Bluff County*, Mitchell, July 14, 1914, (L. M. Gates), 1 ♀. Gering, July 10, 1953, 1 ♀. Scotts Bluff Experiment Station, Aug. 6, 1964, (A. F. Hagen), 1 ♀. *Sheridan County*, Lakeside, Sept. 9, 1954, (E. W. Hamilton), 1 ♀. Rushville, Aug. 24, 1964, 1 ♀, and Sept. 3, 1964, 1 ♂, 2 ♀♀, (A. F. Hagen). *Sioux County*, Glen, Aug. 8, 1905, 1 ♂. Harrison, Aug. 24, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀.

### *Acrolophitus hirtipes* (Say)

*Gryllus hirtipes* Say, 1825:pl. 34—Fifty specimens collected from all the Panhandle counties were examined. This species exhibits some characteristics of the Oedipodinae grasshoppers. The hind wing has a broad subapical band with a semiopaque white disc. It can often be located in rangeland by its habit of staying in one place and loudly stridulating. Plants of the family Boraginaceae appear to comprise the main food of the species. Most of the borages it feeds on are the prostrate forms, therefore, this grasshopper is more often found in short grass ranges.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Box Butte County*, Box Butte, July 2, 1954, (H. A. Hauke), 1 ♀. Hemingford, Aug. 16, 1966, (A. F. Hagen), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 12, 1901, (W. A. Carriker, Jr.), 3 ♂♂, 1 ♀; July 7, 1965, (A. F. Hagen), 1 ♂. Lodgepole, Aug. 3, 1954, 1 ♂. *Dawes County*, Chadron, July 12, 1962, (A. F. Hagen), 4 ♀♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 2 ♀♀. *Garden County*, Oshkosh, July 10, 1953, (H. A. Hauke), 1 ♀; Aug. 23, 1966, 2 ♂♂, and Aug. 21, 1967, 1 ♂, 1 ♀, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 2 ♀. *Morrill County*, Bridgeport, July 3, 1964, (A. C. Scoggan), 1 ♀; Aug. 25, 1964, 1 ♀, and Aug. 21, 1967, 1 ♂, 2 ♀♀, (A. F. Hagen). *Scotts Bluff County*, Mitchell, July 8, 1923,

(L. G. Worley), 1 ♀. Scotts Bluff Experiment Station, Aug. 31, 1960, 2 ♀ ♀, July 21, 1962, 2 ♀ ♀, and Aug. 6, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Sheridan County*, Rushville, Sept. 3, 1964, 3 ♀ ♀, and Aug. 5, 1965, 1 ♂, (A. F. Hagen). *Sioux County*, Glen, July, (M. A. Carriker, Jr.), 1 ♀; Aug. 8, 1905, 1 ♂, 1 ♀, and July 12, 1910, (L. Bruner), 1 ♂. Monroe Canyon, June 30, 1911, (R. W. Dawson), 1 ♂, 1 ♀. University Lake, July 2, 1953, (E. W. Hamilton), 1 ♀; July 10, 1964, 1 ♂, and July 31, 1964, 1 ♂, (A. F. Hagen).

## *Opeia obscura* (Thomas)

*Oxycoryphus obscurus* Thomas, 1872:466—This is one of the more common rangeland species. Prior to this study, it had been collected from Cheyenne, Dawes, Deuel, Kimball, Scotts Bluff, Sheridan and Sioux Counties. I collected it in Banner, Box Butte, Garden and Morrill Counties, which gives it a continuous distribution throughout the Panhandle.

This species is found almost always in short grass rangeland. Adults normally occur from mid-August to mid-September. A May collection of an adult occurred in 1964. This species, as well as adults of *Amphitornus coloradus* (Thomas), *Philbostroma quadrimaculatum* (Thomas), *Cordillacris occipitalis occipitalis* (Thomas) and *Ageneotettix deorum* (Scudder), was found on a south slope of the Wildcat Hills in Banner County. It is possible they overwintered as adults or late instars in this protected site. They could also have been a second generation from the previous year, overwintering as nymphs. Shotwell (1941) mentions the possibility of a second generation overwintering in a warm protected area.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, 1 ♀, and Aug. 5, 1964, 3 ♂ ♂, 7 ♀ ♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♂, 1 ♀. Alliance, Sept. 3, 1964, 1 ♂, and Aug 31, 1965, 1 ♀ (A. F. Hagen). Hemingford, Aug. 26, 1966, (A. F. Hagen), 2 ♂ ♂. *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 1 ♀; Aug. 31, 1964, 2 ♀ ♀, and Aug. 22, 1966, 1 ♀, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 5 ♀ ♀. Crawford, Aug. 15, 1966, (A. F. Hagen), 1 ♂, 4 ♀ ♀. *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 4 ♂ ♂, 3 ♀ ♀. Chappell, Sept. 2, 1964, (A. F. Hagen), 3 ♀ ♀. *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 3 ♀ ♀. *Kimball County*, Bushnell, Aug. 20, 1949, (H. A. Hauke), 1 ♀. Kimball, Aug. 31, 1964, (A. C. Scoggan), 1 ♀; Aug. 31, 1964, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 1 ♂. *Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 1 ♀. Scotts Bluff Experiment Station, Aug. 31, 1960, (A. F. Hagen), 3 ♀ ♀. *Sheridan County*, Gordon, September, 8 ♀ ♀. Rushville, Aug. 24, 1964, 1 ♂, Sept. 3, 1964, 12 ♂ ♂, 9 ♀ ♀, Aug. 5, 1965, 1 ♂, and

Sept. 7, 1966, 3 ♂♂, (A. F. Hagen). *Sioux County*, Agate, Aug. 20, 1906, (L. Bruner), 2 ♂♂, 1 ♀. *Monroe Canyon*, Aug. 19, 1908, (J. T. Zimmer), 1 ♀. *Warbonnet Canyon*, Aug. 22, 1947, (H. A. Hauke), 1 ♂. *Montrose*, Aug. 22, 1947, (H. A. Hauke), 1 ♀. *Glen*, Aug. 22, 1949, (H. A. Hauke), 2 ♂♂, 2 ♀♀. *University Lake*, Aug. 18, 1964, (A. F. Hagen), 1 ♀.

## *Amphitornus coloradus* (Thomas)

*Stenobothrus bicolor* Thomas, 1872:465—I found this species throughout the Panhandle. The absence or presence of supplementary carinae on the pronotol disc has been used to designate subspecies. The series of 34 males and 52 females examined in this study showed a variation from prominent supplementary carinae to a complete lack of them. Specimens having the more prominent supplementary carinae usually had a whitish longitudinal stripe on the dorsum of the pronotum. The use of a subspecies within this species is confusing, therefore, none was used in this study. Individuals of this species feed mostly on rangeland grasses and at times become of economic importance. They occur as adults usually after mid-August but an adult was found May 14, 1964 in Banner County.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, 1 ♂, 1 ♀, and Aug. 5, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Box Butte County*, Hemingford, Aug. 16, 1966, 1 ♂, and Aug. 26, 1966, 1 ♂, (A. F. Hagen). *Alliance*, Sept. 3, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, 1 ♂, and Aug. 22, 1967, 2 ♂♂, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 1 ♀. *Ft. Robinson*, June 27, 1951, (H. A. Hauke), 2 nymphs. *Crawford*, July 18, 1947, (H. A. Hauke), 1 ♀; Aug. 14, 1962, 2 ♀♀, July 16, 1963, 8 ♂♂, 4 ♀♀, and July 15, 1964, 3 ♂♂, 1 ♀, (A. F. Hagen). *Chadron*, July 12, 1962, 7 ♂♂, 11 ♀♀, and July 16, 1963, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, Sept. 2, 1964, 1 ♂, 1 ♀, July 29, 1965, 1 ♂, and Aug. 21, 1966, 1 ♀, (A. F. Hagen). *Garden County*, Oshkosh, July 7, 1964, (A. C. Scoggan), 2 ♂♂, 1 ♀; Sept. 2, 1964, (A. F. Hagen), 1 ♂, 2 ♀♀. *Kimball County*, Kimball, Aug. 31, 1964, 1 ♀, and Aug. 23, 1967, 1 ♀, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, 1 ♀, and Aug. 21, 1967, 1 ♂, (A. F. Hagen). *Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 2 ♀♀. *Mitchell*, Aug. 2, 1923, (M. H. Swenk), 1 ♂. *Scotts Bluff Experiment Station*, Aug. 6, 1964, 1 ♂, and Aug. 3, 1964, 2 ♀♀, (A. F. Hagen). *Sheridan County*, Gordon, 1 ♂, 3 ♀♀. *Rushville*, Aug. 24, 1964, 1 ♂, Sept. 3, 1964, 1 ♂, 1 ♀, Aug. 26, 1966, 2 ♀♀, and Aug. 7, 1966, 1 ♂ (A. F. Hagen). *Sioux County*, *Sioux County*, July, (M. A. Carriker, Jr.), 7 ♀♀. *Glen*, Aug. 22, 1949, (H. A. Hauke), 2 ♂♂. *Harrison*, Aug. 29, 1966, (A. F. Hagen), 2 ♂♂, 3 ♀♀.

## *Eritettix simplex tricarinatus* (Thomas)

*Stenobothrus tricarinatus* Thomas, 1873:84—At first glance, this species can easily be confused with *Opeia obscura*. The presence of clubbed antennae separates it from *O. obscura* which has ensiform antennae. It overwinters as a nymph and appears usually as an adult before *Opeia* hatches. It is present in all of the Panhandle counties normally in short grass rangeland.

Specimens Examined: *Banner County*, Harrisburg, June 28, 1964, (A. F. Hagen), 2 ♂♂, 2 ♀♀. *Box Butte County*, Hemingford, June 20, 1966, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, June 20, 1966, (A. F. Hagen), 3 ♀♀. *Dawes County*, Ft. Robinson, June 27, 1951, (H. A. Hauke), 1 ♀; June 9, 1954, (L. W. Quate), 1 ♀. Pine Ridge, July, 1 ♂, 1 ♀. Chadron, June 10, 1954, (L. W. Quate), 1 ♂; May 5, 1955, (E. W. Hamilton), 1 ♂. *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 1 ♂. Chappell, June 10, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, June 20, 1966, 1 ♀, and Aug. 21, 1967, 1 ♂, (A. F. Hagen). *Kimball County*, Kimball, June 30, 1964, (A. F. Hagen), 1 ♀. *Morrill County*, Bridgeport, June 25, 1965, (A. F. Hagen), 3 ♀♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, June 24, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Sheridan County*, Niobrara River, Sept. 27, 1950, 1 ♀. Rushville, June 20, 1964, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Sioux County*, Warbonnet Canyon, 1 ♂, 2 ♀♀. Harrison, June 8, 1954, (L. W. Quate), 1 ♀. Agate, June 9, 1954, (W. Burkholder), 1 ♂, 1 ♀.

## *Philbostroma quadrimaculatum* (Thomas)

*Stenobothrus quadrimaculatus* Thomas, 1871:280—This species is common in the rangeland areas of the Panhandle. When injurious populations of rangeland species occur, this species is usually one of those involved in the infestation. It is a grass feeder found intermingled with populations of *Opeia obscura*, *Ageneotettix deorum* and *Amphitornus coloradus*. This is one of the species that occurred in May as an adult in 1964 in Banner County.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, 1 ♂, 1 ♀, and Aug. 5, 1964, 2 ♀♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♀. *Cheyenne County*, Sidney, Aug. 21, 1964, 1 ♂, and Aug. 31, 1964, 1 ♀, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 1 ♀. Chadron, August, 1888, 1 ♀; July 12, 1962, (A. F. Hagen), 2 ♂♂, 5 ♀♀. Crawford, July 15, 1964, 1 ♂, and July 31, 1964, 1 ♀, (A. F. Hagen). *Deuel County*, Big Springs, Sept. 26, 1960, (H. A. Hauke), 1 ♂, 1 ♀. Chappell, Sept. 2, 1964, (A. F. Hagen), 2 ♂♂. *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 2 ♂♂, 1 ♀. *Kimball County*, Kimball, Aug. 31, 1964, (A. F. Hagen), 3 ♀♀. *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 1 ♂, 1 ♀.

*Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 1 ♀. *Scotts Bluff Experiment Station*, Aug. 30, 1960, (A. F. Hagen), 2 ♂♂, 10 ♀♀. *Sheridan County*, Rushville, Aug. 24, 1964, 1 ♀, and Sept. 3, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Sioux County*, Sioux County, July, (M. A. Carriker, Jr.), 1 ♀; July, (M. Cary), 1 ♀. *Glen*, Aug. 22, 1949, (H. A. Hauke), 2 ♂♂, 1 ♀.

## *Cordillacris occipitalis occipitalis* (Thomas)

*Stenobothrus occipitalis* Thomas, 1873:81—A series of 23 males and 38 females is in the collection from the Panhandle. Included are those previously identified by Hauke (1953), as *C. occipitalis cinerea*. Dr. Nicholas Jago of the Academy of Natural Sciences of Philadelphia is currently studying this genus on a nationwide basis. Until his work is published, it is felt that all specimens in this genus collected from the Panhandle more closely show the characteristics, as I now know them, of *C. occipitalis occipitalis* than those of *C. occipitalis cinerea*. I have specimens in the collection from Wyoming that are labeled *C. occipitalis cinerea*. They are definitely different in tegminal markings from those in Nebraska. The color differences involving degrees of pink color on the tibiae, or the presence or absence of a pale streak on the tegmina between the discoidal and mediastine vein appear too variable to serve as a basis for subspecies recognition. A range of deep pink to light pink on the tibiae was noted in the specimens examined in this study. This species occurs in rangeland in all the Panhandle counties but is not plentiful.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, 1 ♂, and Aug. 31, 1966, 1 ♂, 3 ♀♀, (A. F. Hagen). *Box Butte County*, Hemingford, Aug. 16, 1966, (A. F. Hagen), 2 ♀♀. *Cheyenne County*, Sidney, Aug. 12, 1901, (M. A. Carriker, Jr.), 1 ♀; July 29, 1965, (A. F. Hagen), 2 ♀♀. *Dawes County*, Pine Ridge, July, 2 ♂♂, 5 ♀♀. *Ft. Robinson*, June 27, 1951, (H. A. Hauke), 2 ♂♂. *Deuel County*, Chap-pell, July 29, 1965, 1 ♀, and Aug. 22, 1967, 1 ♂, 1 ♀, (A. F. Hagen). *Garden County*, Oshkosh, July 7, 1964, (A. C. Scoggan), 2 ♀♀; Aug. 23, 1966, (A. F. Hagen), 1 ♀. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Morrill County*, Northport, July 5, 1951, 3 ♂♂, 4 ♀♀, and July 13, 1951, 2 ♂♂, 2 ♀♀, (H. A. Hauke). *Bridgeport*, June 25, 1965, (A. F. Hagen), 2 ♂♂, 2 ♀♀. *Scotts Bluff County*, *Scotts Bluff Experiment Station*, Aug. 30, 1960, 1 ♀, and Aug. 31, 1960, 1 ♀, Gering, Aug. 30, 1966, (A. F. Hagen), 1 ♂. *Sheridan County*, Gordon, 1 ♂. *Rushville*, Sept. 3, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Sioux County*, Sioux County, July, (M. A. Carriker, Jr.), 3 ♀♀. *Glen*, Aug. 22, 1949, (H. A. Hauke), 1 ♂, 1 ♀. *Agate*, July 4, 1951, (H. A. Hauke), 4 ♂♂, 2 ♀♀. *Harrison*, Aug. 29, 1966, (A. F. Hagen), 1 ♀.

## *Orphulella speciosa* (Scudder)

*Stenobothrus speciosus* Scudder, 1862:458—Bruner (1897) stated that this species is "very common on the open prairies over the entire state." This is not the situation in the Panhandle. Prior to this study, it had been reported from only three Panhandle counties—Sheridan, Cheyenne and Dawes. In addition, Gurney (1940) lists specimens of this species from Fort Robinson and Glen in Sioux County. A total of 14 males and 21 females are now in the collection representing all the Panhandle counties. It was not numerous and found only in small areas of each county. The feeding habits are not clear, however, Brooks (1958) lists it as a grass feeder. It was not found associated with forbs in the Panhandle and found only in the high dryer areas of the counties.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 1 ♀. *Box Butte County*, Alliance, Aug. 26, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Cheyenne County*, Sunol, Aug. 19, 1949, (H. A. Hauke), 1 ♂. Sidney, Aug. 22, 1967, (A. F. Hagen), 1 ♀. *Dawes County*, Ft. Robinson, August, 1888, 2 ♀♀. Chadron, August, 1888, 1 ♀. Crawford, Aug. 15, 1966, (A. F. Hagen), 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 2 ♂♂. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 2 ♂♂. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂. *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 2 ♂♂. *Scotts Bluff County*, Mitchell, Aug. 24, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Sheridan County*, Gordon, 1 ♀. Rushville, Aug. 5, 1966, 3 ♂♂, 3 ♀♀, Aug. 26, 1966, 4 ♂♂, 7 ♀♀, and Sept. 7, 1966, 2 ♂♂, 1 ♀, (A. F. Hagen). *Sioux County*, Harrison, Aug. 30, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀.

## *Dichromorpha viridis* (Scudder)

*Chloealtis viridis* Scudder, 1862:455—Bruner (1897) and Hebard (1925) listed the range of this species as middle and eastern Nebraska. Apparently this range has not expanded since that time. Only those specimens listed below from Scotts Bluff County, collected in 1904, are in the collection from the Panhandle. During the present study, several collecting trips were made for the specific purpose of collecting this species. The habitats listed by Hauke (1953) were closely examined but no specimens were found. In 1904, Scotts Bluff County was largely semi-arid rangeland. It is now mostly surface irrigated crop land. It is interesting to speculate that in 1904 this area was a fringe area which was extended into by this species under climatic conditions at that time. Changes in these conditions caused it to withdraw eastward. Then the changes in agronomic practices eliminated the fringe area.

Specimens Examined: *Scotts Bluff County*, Scottsbluff, Oct. 5, 1904, 3 ♀♀.



## *Chloealtis conspersa* (Harris)

*Locusta (Chloealtis) conspersa* Harris, 1841:149—Only specimens from Dawes and Sioux Counties collected in 1908 were in the collection from the Panhandle before this study. During this study, specimens from Banner, Garden, Scotts Bluff and Sheridan Counties were added to the list. This species was usually found near the edge of forested areas or in moist areas of rank grass. In Banner, Scotts Bluff and Sheridan Counties, it was found near coniferous forest areas. Deciduous timber area along the North Platte River is the habitat in Garden County. Extensive collecting may show it to be present in Morrill County in areas of similar habitat. It appears to be a grass feeder as it was found only in grassland areas. Gurney *et al.* (1964) state that of the few North American grasshoppers which oviposit in dead wood this species is best known. This habit of oviposition in dead and decaying wood accounts for its presence in forested areas.

Specimens Examined: *Banner County*, Harrisburg, Aug. 23, 1967, (A. F. Hagen), 1 ♂. *Dawes County*, Pine Ridge, July 8, 1910, (L. Bruner), 1 ♀. *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 1 ♂. *Scotts Bluff County*, Gering, Aug. 30, 1967, (A. F. Hagen), 2 ♂♂. *Sheridan County*, Rushville, Aug. 29, 1967, (A. F. Hagen), 1 ♂. *Sioux County*, Monroe Canyon, Aug. 12, 1908, (L. Bruner), 1 ♀; August, 1908, (R. W. Dawson), 1 ♀.

## *Chorthippus curtippennis* (Harris)

*Locusta curtippennis* Harris, 1835:566—In recent literature, Hauke (1953), Brooks (1958) and others use the name *Chorthippus longicornis* Latreille for this species. Vickery (1964) suppressed the specific name *longicornis* as of uncertain identity and replaced it with *curtippennis* (Harris). Throughout the history of this species both specific names have been used but Vickery's work seems to establish *curtippennis* as the correct name. Specimens in the collection before this study are from Scotts Bluff and Sioux Counties. There are now specimens from all the Panhandle counties. At no time were large populations of this species found. The specimens collected during this study were found in wet lowland areas where species of *Carex* grow. Mulkern *et al.* (1969) lists grasses as its principal food. Sedges made up a small portion of the diet in his report. Gangwere (1961) listed both sedges and grasses as its principal food. A male specimen labeled Omaha, Douglas County, 1875 is the oldest specimen of Orthoptera in the University of Nebraska collection.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Box Butte County*, Hemingford, Aug. 26, 1966 (A. F. Hagen), 2 ♀♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 1 ♂. *Dawes County*, Crawford, Aug. 15, 1966, (A. F.

Hagen), 1 ♂, 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 1 ♀. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 2 ♂♂, 2 ♀♀. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♀. *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 1 ♀. *Sheridan County*, Rushville, Aug. 26, 1966, 5 ♂♂, 2 ♀♀, and Sept. 7, 1966, 1 ♂, 1 ♀, (A. F. Hagen). *Sioux County*, Warbonnet Canyon, 3 ♂♂.

### *Aeropedellus clavatus* (Thomas)

*Gomphocerus clavatus* Thomas, 1873:96—This species has a limited distribution in the Panhandle. At present, only four Panhandle counties (Dawes, Morrill, Garden and Sioux) are represented in the collection. This is an increase of one county over those listed by Hauke (1953). It was found in this study on wetland river bottoms in Garden County. This wetland river bottom may be the most similar of all Panhandle sites to mountain meadows which was reported as a habitat by Ball *et al.* (1942). In the Panhandle, it appears as an adult early in June. The six males and six females in the collection were collected from June 10 to July 10.

Specimens Examined: *Dawes County*, Pine Ridge, July, 1 ♀, July 8, 1910, (L. Bruner), 2 ♀♀. *Crawford*, June 10, 1910, (L. Bruner), 1 ♂, 1 ♀. *Ft. Robinson*, June 27, 1951, (H. A. Hauke), 2 ♂♂. *Whitney*, July 11, 1951, 1 ♀. *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 1 ♂. *Morrill County*, Northport, July 5, 1951, 1 ♂, and July 10, 1951, 1 ♀, (H. A. Hauke). *Sioux County*, Sioux Co., 1 ♂. *Warbonnet Canyon*, 1 ♂.

### *Ageneotettix deorum* (Scudder)

*Chrysochraon deorum* Scudder, 1876a:262—Many authors have used only *deorum* for the specific name of this species. However, Brooks (1958) states that there are two subspecies—*deorum deorum* in the northern areas and *deorum curtippennis* in northern Arizona and southwestern Colorado. Based on Brooks' statement, the subspecies in the Panhandle is probably *deorum*. Brooks did not indicate the differences that separate the two subspecies. I found this grasshopper throughout the Panhandle. It is probably the most numerous and widespread of all the rangeland species. When economic rangeland infestations occur in the Panhandle, this has been the principal species involved.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, 1 ♀, Aug. 5, 1964, 1 ♂, 2 ♀♀, Aug. 14, 1964, 1 ♂, and Sept. 2, 1964, 1 ♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♂, 1 ♀. *Alliance*, Sept. 27, 1967, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, Aug. 12, 1901, 1 ♀; Aug. 31, 1964, 2 ♀♀, and Aug. 22, 1967,

1 ♂, (A. F. Hagen). *Dawes County*, Ft. Robinson, June 27, 1951, (H. A. Hauke), 5 nymphs. Pine Ridge, July, 1 ♂. Chadron, July 12, 1962, 10 ♂♂, 7 ♀♀, and Aug. 31, 1964, 1 ♀, (A. F. Hagen). Crawford, July 18, 1947, (H. A. Hauke), 3 ♂♂, 5 ♀♀; July 31, 1962, 1 ♂, 3 ♀♀, July 16, 1963, 3 ♂♂, 8 ♀♀, July 15, 1964, 1 ♀, and July 16, 1964, 2 ♂♂, 1 ♀, (A. F. Hagen). *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 1 ♂, 2 ♀♀. Chappell, Sept. 2, 1964, 2 ♀♀, and July 29, 1965, 1 ♀, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, 1 ♂, 1 ♀, and Aug. 21, 1967, 1 ♂, (A. F. Hagen). *Kimball County*, Bushnell, Aug. 20, 1949, (H. A. Hauke), 1 ♂. Kimball, Aug. 23, 1967, (A. F. Hagen), 3 ♂♂, 1 ♀. *Morrill County*, Northport, July 5, 1951, (H. A. Hauke), 1 ♀. Bridgeport, Aug. 25, 1964, (A. F. Hagen), 3 ♀♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 31, 1960, (A. F. Hagen), 1 ♀. Gering, Aug. 30, 1967, (A. F. Hagen), 2 ♂♂, 1 ♀. *Sheridan County*, Gordon, July, 1 ♀. Rushville, Aug. 24, 1964, 1 ♀, and Sept. 3, 1964, 3 ♂♂, 4 ♀♀, (A. F. Hagen). *Sioux County*, Glen, July, (M. A. Carriker, Jr.), 2 ♂♂, 1 ♀; July, (M. Cary), 1 ♀; Aug. 22, 1949, (H. A. Hauke), 1 ♂, 4 ♀♀. Montrose, Aug. 22, 1947, (H. A. Hauke), 1 ♀. Harrison, Aug. 17, 1964, (A. F. Hagen), 1 ♀.

### *Psoloessa delicatula delicatula* (Scudder)

*Scyllina delicatula* Scudder, 1876a:263—Specimens from three counties were in the collection prior to this study. The other eight Panhandle counties have been added to its distribution. The grasshopper overwinters as a nymph, usually fourth or fifth instar, and becomes adult early in the spring. Grasses and a few forbs appear to comprise the major part of its diet. Early in the spring I observed the nymphs feeding on six-weeks fescue *Festuca octoflora* Walt. It was usually found in areas of sparse vegetation. At the beginning of this investigation, this species was scarce in the Panhandle. In the spring of 1968, many more individuals were noted than in the past years and it appears to be on the increase.

Specimens Examined: *Banner County*, Harrisburg, June 25, 1964, (A. F. Hagen), 2 ♀♀. *Box Butte County*, Hemingford, June 10, 1966, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, June 30, 1964, (A. C. Scoggan), 1 ♀. *Dawes County*, Pine Ridge, July, 1 ♀; June 10, 1954, (L. W. Quate), 1 ♀. Chadron, April 5, 1955, 1 ♀, April 6, 1955, 1 ♂, and May 5, 1955, 1 ♀, (E. W. Hamilton). Crawford, April 18, 1963, (A. F. Hagen), 2 ♀♀. *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 2 ♀♀. *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Kimball County*, Kimball, June 10, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Morrill County*, Bridgeport, July 3, 1964, (A. C. Scoggan), 1 ♀. *Scotts Bluff County*, Mitchell, June 25, 1913, (L. M. Gates), 1 ♀. Scotts Bluff Experiment Station, June 24, 1964, (A. F. Hagen), 2 ♂♂. *Sheridan County*, Rushville, June 23, 1965, (A. F.

Hagen), 1 ♀. *Sioux County*, University Lake, June 11, 1964, (A. F. Hagen), 1 ♀.

### ***Boopedon nubilum* (Say)**

*Gryllus nubilum* Say, 1825a:308—I found this grasshopper at higher elevations in all the Panhandle counties. In 1966 and 1967, this species was the predominant grasshopper on the Scotts Bluff National Monument. During the study, two black females, both brachypterous, were collected. The rest of the females are greenish-brown; on one of these the wings extend beyond the abdomen. All the males are black and brachypterous. The white annulus at the apex of the femur on the males ranges from prominent to absent. Mulkern *et al.* (1969) lists tall grasses as the principal food of this species.

Specimens Examined: *Banner County*, Pumpkin Creek, Aug. 23, 1947, (H. A. Hauke), 1 ♀. *Harrisburg*, Aug. 23, 1967, (A. F. Hagen), 6 ♂♂, 1 ♀. *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 1 ♂. *Alliance*, Sept. 29, 1967, (A. F. Hagen), 4 ♂♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, 1 ♂, 1 ♀, and Aug. 22, 1967, 4 ♂♂, (A. F. Hagen). *Dawes County*, Ft. Robinson, Sept. 5, 1962, 4 ♂♂. *Chadron*, Aug. 4, 1966, (A. F. Hagen), 1 ♂. *Crawford*, Aug. 29, 1967, (A. F. Hagen), 5 ♂♂, 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, 1 ♂, and Aug. 22, 1967, 6 ♂♂, 1 ♀, (A. F. Hagen). *Garden County*, Lewellen, Aug. 13, 1955, (L. W. Quate), 1 ♂. *Oshkosh*, Aug. 23, 1966, 1 ♂, 1 ♀, and Aug. 21, 1967, 7 ♂♂, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1966, 2 ♂♂, and Aug. 23, 1967, 6 ♂♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, 2 ♂♂, and Aug. 21, 1967, 5 ♂♂, 1 ♀, (A. F. Hagen). *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 6, 1964, 1 ♂, 1 ♀, Aug. 7, 1964, 1 ♀, and Aug. 21, 1964, 1 ♀, (A. F. Hagen). *Gering*, Aug. 30, 1967, (A. F. Hagen), 12 ♂♂, 3 ♀♀. *Sheridan County*, Rushville, Sept. 7, 1966, 2 ♂♂, and Aug. 29, 1967, 4 ♂♂, 1 ♀, (A. F. Hagen). *Sioux County*, Glen, Aug. 8, 1905, 2 ♀♀. *Wood Reserve*, Ft. Robinson, Aug. 29, 1959, 1 ♂, and Aug. 25, 1959, 3 ♂♂, (W. E. LaBerge). *Harrison*, Aug. 29, 1967, (A. F. Hagen), 2 ♂♂, 2 ♀♀.

### ***Drepanopterna femoratum* (Scudder)**

*Aulocara femoratum* Scudder 1899a:55—Specimens of this species are in the collection from all the Panhandle counties. It is more abundant in the central and southern Panhandle. Hauke (1953) states this species is "one which has been taken but rarely." In this investigation, it was found rather evenly distributed in rangeland and sometimes in economic populations. This was one of the species that contributed to economic rangeland injury in Scotts Bluff County in 1965 through 1967 when a control program was conducted. Freshly col-

lected specimens are easily separated from *A. elliotti* by the prominent bars on the femora. However, only the more permanent characteristics, such as the length of the spurs on the femora, should be used to separate the older specimens in a collection. The color markings fade in storage and the two species are difficult to tell apart.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, (A. F. Hagen), 4 ♂♂, 4 ♀♀. *Box Butte County*, Alliance, Sept. 3, 1964, 1 ♂, 1 ♀, and Sept. 21, 1967, 1 ♀, (A. F. Hagen). Hemingford, Aug. 16, 1966, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, Aug. 31, 1964, 1 ♂, 1 ♀, July 29, 1965, 1 ♀, and Aug. 22, 1967, 1 ♂, (A. F. Hagen). *Dawes County*, Chadron, August, 1888, 1 ♀; Aug. 4, 1966, (A. F. Hagen), 1 ♀. Crawford, Aug. 8, 1962, 1 ♂, Aug. 8, 1963, 2 ♂♂, and July 15, 1964, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, July 29, 1965, 1 ♀, and Aug. 22, 1967, 1 ♂, 2 ♀♀, (A. F. Hagen). *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 4 ♂♂, 5 ♀♀. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂, 4 ♀♀. *Morrill County*, Northport, Aug. 2, 1951, (H. A. Hauke), 7 ♂♂, 5 ♀♀. Bridgeport, Aug. 25, 1964, (A. F. Hagen), 2 ♀♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 21, 1963, (A. F. Hagen), 1 ♀. Gering, Aug. 24, 1966, (A. F. Hagen), 3 ♂♂, 6 ♀♀. *Sheridan County*, Rushville, Aug. 26, 1966, (A. F. Hagen), 3 ♂♂, 3 ♀♀. *Sioux County*, Sioux Co., 1 ♀. Agate, Aug. 20, 1951, (H. A. Hauke), 1 ♂. Harrison, Aug. 29, 1967, (A. F. Hagen), 1 ♀.

## *Aulocara elliotti* (Thomas)

*Stauronotus elliotti* Thomas, 1870:82—This species occurs throughout the Panhandle but is more abundant in the northern counties. In cage studies of this species and *D. femoratum*, a male of the latter was observed in copulation with a female *A. elliotti*. The result of this mating is unknown, but it raises the possibility of a hybrid occurring. Cytogenetic studies on these species should prove interesting. This grasshopper feeds on several grass species and occasionally causes economic damage.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂. *Box Butte County*, Hemingford, Aug. 16, 1966, (A. F. Hagen), 1 ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Dawes County*, Pine Ridge, July, 1 ♀. Chadron, July 12, 1962, 10 ♂♂, 3 ♀♀. Crawford, Aug. 8, 1963, 2 ♂♂, and July 15, 1964, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, Sept. 2, 1964, (A. F. Hagen), 1 ♂. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 2 ♂♂, 2 ♀♀. *Kimball County*, Kimball, Aug. 31, 1964, (A. F. Hagen), 1 ♀. *Morrill County*, Northport, Aug. 2, 1951, (H. A. Hauke), 1 ♂. Bridgeport, Aug. 22, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀.

*Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 3 ♀ ♀. *Scotts Bluff Experiment Station*, Aug. 30, 1964, 8 ♂ ♂, 4 ♀ ♀, and Sept. 21, 1966, 1 ♀, (A. F. Hagen). *Sheridan County*, Rushville, Aug. 26, 1966, (A. F. Hagen), 1 ♂, 2 ♀ ♀. *Sioux County*, Glen, Aug. 8, 1905, 2 ♀ ♀; Aug. 22, 1949, (H. A. Hauke), 1 ♂, 1 ♀. *Monroe Canyon*, Aug. 20, 1908, (C. H. Gable), 1 ♂, 1 ♀; Aug. 24, 1908, (R. W. Dawson), 1 ♂. *Sioux County*, July, (M. A. Carriker, Jr.), 4 ♀ ♀; July (M. Cary), 2 ♂ ♂, 3 ♀ ♀. *Agate*, June 30, 1951, (H. A. Hauke), 3 ♂ ♂, 1 ♀. *Harrison*, Aug. 29, 1966, (A. F. Hagen), 3 ♂ ♂, 6 ♀ ♀.

## *Heliaula rufa* (Scudder)

*Alucara rufum* Scudder 1899a:55—Literature has placed this species in both the subfamilies, Acridinae and Oedipodinae, depending on the choice of the writer. It has characteristics of both subfamilies as they are now defined. Gurney (1965) mentions that this and other genera are intermediate between the two subfamilies. The above adds to the evidence that the two subfamilies can no longer be considered separate. This species was found only on gravelly hillsides in Banner, Scotts Bluff and Sioux Counties during this study. Prior collected specimens are present from Cheyenne County. They were not numerous at any collection sites. When disturbed, they would jump once, then usually hide.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 4 ♀ ♀; Aug. 12, 1901, (M. A. Carriker, Jr.), 2 ♀ ♀. *Scotts Bluff County*, Scotts Bluff Station, Aug. 6, 1964, (A. F. Hagen), 5 ♂ ♂, 9 ♀ ♀. *Sioux County*, University Lake, July 30, 1965, (A. F. Hagen), 2 ♂ ♂, 3 ♀ ♀.

## SUBFAMILY OEDIPODINAE

### *Arphia conspersa* Scudder

*Arphia conspersa* Scudder, 1875b:514—Thirty-four males and 21 females represent collections from all Panhandle counties. This species overwinters usually as a fourth or fifth instar nymph and is adult from late April to early July. Most of the adults appear in June. It has dimorphic hind wing discs. All but two of the specimens collected from the Panhandle have red hind wing discs. The two exceptions collected from Dawes County have yellow wing discs. Scoggan (1966) stated that the Wheatland Canyon area of Wyoming seems to be the locality where this species changes from predominantly red discs to predominantly yellow discs. Hewitt and Barr (1967) listed reddish-

orange, pink, red or yellow as the color of the wing disc of Idaho specimens. Specimens I collected from Laramie, Wyo., and Cameron Pass, Colo., have yellow discs. Willey and Willey (1967) stated that this species is sedentary in its habits. They present evidence that topographic barriers tend to keep the color of the wing disc the same for all individuals in a given area.

Specimens Examined: *Banner County*, Harrisburg, June 25, 1964, (A. C. Scoggan), 1 ♂, 1 ♀, and (A. F. Hagen), 3 ♂♂. *Box Butte County*, Hemingford, July 1, 1964, (A. C. Scoggan), 2 ♂♂. *Cheyenne County*, Sidney, June 30, 1964, (A. C. Scoggan), 2 ♂♂; June 20, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes County*, Crawford, June 10, 1910, (L. Bruner), 2 ♂♂, 2 ♀♀; June 18, 1964, (A. F. Hagen), 2 ♀♀. *Deuel County*, Chappell, July 7, 1964, (A. C. Scoggan), 1 ♂, 1 ♀. *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 2 ♂♂. *Kimball County*, Kimball, May 2, 1963, (A. F. Hagen), 2 ♂♂, 7 ♀♀; June 30, 1964, (A. C. Scoggan), 1 ♂. *Morrill County*, Bridgeport, June 20, 1966, (A. F. Hagen), 3 ♂♂, 1 ♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, April 27, 1962, 9 ♂♂, 3 ♀♀, and May 1, 1963, 3 ♂♂, (A. F. Hagen). *Sheridan County*, Rushville, June 20, 1966, (A. F. Hagen), 2 ♂♂. *Sioux County*, Sioux Co., 2 ♀♀; June, (M. Cary), 1 ♀.

## *Arphia pseudonietana pseudonietana* (Thomas)

*Tomonotus pseudonietana* Thomas, 1870:82—This is the only other species of *Arphia* found in the Panhandle. Bruner (1897) stated that *Arphia xanthoptera* (Burmeister) was "also found in the western part of the state." This has not been substantiated by collecting in this area. *Arphia conspersa* and *Arphia p. pseudonietana* occur together as adults in early July and can be confused at that time without close examination. *Arphia p. pseudonietana* is the more numerous of the two and occasionally causes economic damage to rangeland; areas of injury are not extensive. Two pastures in Box Butte County, from 1962 to 1964, had a heavily grazed appearance caused by this species. Hebard (1925) mentioned that this species prefers areas of poor soil in a dry environment. In the Panhandle, it appears in about equal numbers in this habitat and in lush growth lowland areas. The hind wing disc varies in color from dark red to orange, the latter not being common. The teneral is light green color while the more mature adult is dark brown to black.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 4 ♂♂, 4 ♀♀, Aug. 3, 1964, 1 ♀, and Aug. 5, 1964, 1 ♀, (A. F. Hagen). *Box Butte County*, Hemingford, Sept. 13, 1962, 1 ♂, Sept. 15, 1962, 1 ♀, and Sept. 18, 1962, 14 ♂♂, 7 ♀♀, (A. F. Hagen). *Cheyenne County*, Sidney, Aug. 12, 1901, (M. A. Carriker, Jr.), 1 ♂, 1 ♀; Aug. 12, 1901, (L. Bruner), 1 ♂; Aug. 31, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes*

*County*, Pine Ridge, 1 ♂; July, 4 ♀♀. Crawford, Aug. 31, 1962, 1 ♀, Aug. 14, 1962, 5 ♂♂, 2 ♀♀, and Aug. 15, 1966, 1 ♀, (A. F. Hagen). *Deuel County*, Big Springs, Sept. 9, 1950, (H. A. Hauke), 1 ♀. Chappell, Sept. 2, 1964, 2 ♂♂, and July 29, 1965, 1 ♂, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 2 ♂♂, 1 ♀. *Kimball County*, Bushnell, Aug. 20, 1949, (H. A. Hauke), 2 ♂♂. Kimball, Aug. 31, 1964, 2 ♂♂, and Aug. 23, 1967, 2 ♂♂, (A. F. Hagen). *Morrill County*, Northport, July 13, 1951, (H. A. Hauke), 1 ♂. Bridgeport, Sept. 2, 1964, 2 ♂♂, and Aug. 21, 1967, 3 ♂♂, (A. F. Hagen). *Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 1 ♀; Aug. 30, 1967, (A. F. Hagen), 2 ♂♂, 1 ♀. Morrill, Aug. 31, 1931, (D. B. Whelan), 1 ♀. Scotts Bluff Experiment Station, Aug. 17, 1961, 2 ♂♂, and Aug. 6, 1964, 1 ♀, (A. F. Hagen). *Sheridan County*, Gordon, 3 ♂♂, Aug. 24, 1888, 1 ♀. Rushville, Aug. 24, 1964, 1 ♀, Sept. 3, 1964, 1 ♂, and Aug. 5, 1965, 5 ♂♂, 3 ♀♀, (A. F. Hagen). *Sioux County*, Glen, August, 1908, 1 ♂, Aug. 22, 1949, (H. A. Hauke), 2 ♂♂. Sioux County, July, 1 ♂. Badlands, Aug. 10, 1908, 1 ♂, 1 ♀, and Aug. 12, 1908, 1 ♀, (L. Bruner). Monroe Canyon, Aug. 16, 1908, 1 ♂, Aug. 12, 1908, 1 ♂, 1 ♀, Aug. 20, 1908, 1 ♀, Aug. 22, 1908, 6 ♂♂, 2 ♀♀, and Aug. 23, 1908, 2 ♀♀, (C. H. Gable). Mansfield, Aug. 29, 1951, (H. A. Hauke), 1 ♂. Ft. Robinson, Aug. 25, 1959, (W. E. LaBerge), 1 ♂, 1 ♀. University Lake, July 31, 1964, (A. F. Hagen), 1 ♂.

## *Chortophaga viridifasciata* (De Geer)

*Acrydium viridi-fasciatum* **De Geer, 1773:498**—Brooks (1958) lists this species as a grass feeder. It has been collected in all Panhandle counties and was usually associated with alfalfa-brome grass pastures. Both plants were found in their crops. Populations of this species were lower in pure grass areas than when found in the alfalfa-brome grass habitats. This species is dichromatic with about equal numbers of green and brown specimens. The teneral appears to be always green, requiring about 24 hours to establish its permanent color. The hind wing disc on the specimens examined varies from yellow to clear.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, (A. F. Hagen), 1 ♂. *Box Butte County*, Hemingford, July 1, 1964, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, June 21, 1966, (A. F. Hagen), 2 ♀♀. *Dawes County*, Pine Ridge, July, 1 ♂. Chadron State Park, June 10, 1954, (L. W. Quate), 1 ♂. *Deuel County*, Chappell, June 21, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 3 ♀♀. *Kimball County*, Kimball, May 2, 1963, (A. F. Hagen), 2 ♂♂; June 30, 1964, (A. C. Scoggan), 1 ♂. *Morrill County*, Bridgeport, Aug. 21, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Scotts Bluff County*, Morrill, June 7, 1930, (D. B. Whelan), 1 ♀. Scottsbluff, April 15, 1962, (A. F. Hagen), 3 ♀♀. Mitchell, April 19, 1962, (A. F. Hagen), 11 ♂♂, 14 ♀♀. Scotts Bluff Experiment Station, May



1, 1963, (A. F. Hagen), 3 ♂♂. *Sheridan County*, Niobrara River, Sept. 27, 1950, (H. A. Hauke), 1 ♂. Rushville, June 20, 1966, (A. F. Hagen), 3 ♀♀. *Sioux County*, Sioux Co., 1 ♀; June, 1 ♀; June, (M. Cary), 1 ♀. Warbonnet Canyon, 1 ♂, 1 ♀. Harrison, June 8, 1954, (L. W. Quate), 1 ♂.

### *Encoptolophus sordidus costalis* (Scudder)

*Encoptolophus costalis* Scudder, 1862:473—This species is dichromatic. The majority of the specimens collected were bluish-black but some were light to dark green. Color is not a teneral factor because the teneral is the same color as the mature color. This species appears to be increasing in the Panhandle. At the beginning of this study, very few specimens were found. The population increased yearly until now it is quite common. This species was not found in a grassland area in Sheridan County which has been under observation since 1962. However, large numbers of this grasshopper were present in the area in 1966. I have no explanation for this sudden increase. It may have been present prior to 1966 in the area but mistaken for *Trachyrhachys kiowa kiowa* (Thomas) both on the ground and in flight it resembles this species. It is also a grass feeder as is *T. kiowa kiowa*. It was observed migrating from depleted rangeland in the late fall to adjacent winter wheat in Box Butte County.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, 1 ♂, 1 ♀, and Aug. 23, 1967, 1 ♂, (A. F. Hagen). *Box Butte County*, Alliance, Sept. 27, 1967, (A. F. Hagen), 10 ♂♂, 4 ♀♀. *Cheyenne County*, Sidney, Aug. 22, 1967, (A. F. Hagen), 5 ♂♂, 2 ♀♀. *Dawes County*, Chadron, Aug. 13, 1951, (H. A. Hauke), 7 nymphs. Crawford, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Deuel County*, Chappell, Aug. 22, 1967, (A. F. Hagen), 1 ♂, 2 ♀♀. *Garden County*, Oshkosh, Aug. 21, 1967, (A. F. Hagen), 2 ♂♂, 1 ♀. *Kimball County*, Kimball, Aug. 23, 1967, (A. F. Hagen), 2 ♂♂, 1 ♀. *Morrill County*, Bridgeport, Aug. 21, 1967, (A. F. Hagen), 2 ♂♂. *Scotts Bluff County*, Gering, Aug. 30, 1966, (A. F. Hagen), 3 ♀♀. *Sheridan County*, Rushville, Aug. 26, 1966, 26 ♂♂, 37 ♀♀, and Sept. 7, 1966, 19 ♂♂, 15 ♀♀, (A. F. Hagen). *Sioux County*, Montrose, Aug. 22, 1947, (H. A. Hauke), 5 ♂♂, 5 ♀♀. Warbonnet Canyon, Aug. 22, 1947, (H. A. Hauke), 1 ♂, 1 ♀. Harrison, Aug. 9, 1966, (A. F. Hagen), 1 ♀.

### *Camnula pellucida* (Scudder)

*Oedipoda pellucida* Scudder, 1862:472—Hebard (1925) lists western Nebraska as one of the southern limits of this grasshopper. This species was not collected during the present investigation. Hauke (1953) collected specimens in Sioux County. These are the only ones known from the Panhandle.

Specimens Examined: *Sioux County*, Agate, July 11, 1951, (H. A. Hauke), 9 ♂♂, 1 ♀.

### *Hippiscus rugosus* (Scudder)

*Oedipoda rugosus* Scudder, 1862:469—Gurney (1964) stated that "Hebard (1945) used the name *ocelote* for Virginia specimens and the assumption is that he regarded *rugosus* as a synonym." Hauke (1953) used *ocelote* for the Nebraska specimens he examined, however, none were from the Panhandle. Prior to and since Hauke's paper, the name *rugosus* has been more often used for this species by Mills and Pepper (1938), Ball *et al.* (1942), Thompson (1959), Coppock (1962), Pfadt (1965) and Hewitt and Barr (1967). On the basis of this continual use of *rugosus*, I have used it here for this species. Only two specimens, a male and female from Cheyenne County, were in the collection prior to this study. My collections show it to occur in all Panhandle counties. Its principal habitat in the Panhandle is sparsely vegetated slopes. These are quite often associated with sand or gravel intermittent stream beds.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, 1 ♂, and Aug. 23, 1966, 1 ♂, 1 ♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♀. Hemingford, Aug. 26, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 8 ♂♂, 4 ♀♀. *Dawes County*, Crawford, Aug. 26, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Deuel County*, Chappell, Sept. 9, 1964, 1 ♂, and Aug. 21, 1966, 2 ♂♂, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, 1 ♂, 2 ♀♀, and Aug. 23, 1966, 1 ♂, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 1 ♀. *Scotts Bluff County*, Scotts Bluff Station, July 25, 1962, (A. F. Hagen), 1 ♂. Gering, Aug. 30, 1967, (A. F. Hagen), 1 ♂. *Sheridan County*, Rushville, Aug. 24, 1964, 2 ♂♂, 1 ♀, Sept. 3, 1964, 2 ♀♀, Aug. 5, 1965, 1 ♂, Aug. 26, 1966, 10 ♂♂, 1 ♀, and Sept. 7, 1966, 5 ♂♂, 1 ♀, (A. F. Hagen). *Sioux County*, Harrison, Aug. 30, 1966, (A. F. Hagen), 4 ♂♂, 1 ♀.

### *Pardalophora apiculata* (Harris)

*Locusta apiculata* Harris, 1835:576—This is one of the rarer banded-wing grasshoppers in the Panhandle. Hauke (1953) listed none from Panhandle counties. One specimen from Sioux County was in the collection prior to this investigation. I collected it from Banner, Box Butte, Kimball and Scotts Bluff Counties. This insect occurs early in the summer as an adult on grass covered hillsides. Unlike the following species of *Pardalophora*, this species exhibits no variation in the pink color of the hind wing disc.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964,

(A. F. Hagen), 1 ♂. *Box Butte County*, Hemingford, June 20, 1966, (A. F. Hagen), 1 ♀. *Kimball County*, Kimball, May 2, 1963, (A. F. Hagen), 1 ♂, 3 ♀♀. *Scotts Bluff County*, Scotts Bluff Station, July 6, 1962, (A. F. Hagen), 1 ♀. *Sioux County*, Agate, April 9, 1954, (L. W. Quate), 1 ♀.

### *Pardalophora haldemanii* (Scudder)

*Oedipoda haldemanii* Scudder, 1872:251—This is a common banded-wing grasshopper in the Panhandle. It is sometimes confused with species of *Xanthippus* because it often has reddish color on the underside of the hind femora. This color is usually much paler in *Pardalophora* than in *Xanthippus*; the latter is often called "red shanks" because of the color. Most keys will include these two genera in the same couplet. The separation is on the basis of degree of deepness of the anterior incision of the pronotal carina. Further study is needed to find other morphological characteristics for separation of these two genera. The hind wing disc of *P. haldemanii* may be either pink, red or yellow. This variation occurs in about equal numbers in the series I examined. This species is found closely associated with wheat fields in the Panhandle.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♀, and Aug. 5, 1964, 3 ♂♂, 3 ♀♀, (A. F. Hagen). *Box Butte County*, Hemingford, July 1, 1964, 2 ♂♂, 3 ♀♀, and June 20, 1966, 1 ♀, (A. F. Hagen); July 1, 1964, (A. C. Scoggan), 4 ♂♂, 2 ♀♀. *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 1 ♀; Aug. 12, 1901, (M. A. Carriker, Jr.), 1 ♀; June 30, 1964, (A. C. Scoggan), 1 ♂. *Dawes County*, Pine Ridge, July, 1 ♀. Whitney, Sept. 1, 1954, (E. W. Hamilton), 1 ♀. Chadron, July 9, 1962, 4 ♂♂, 3 ♀♀, and July 12, 1962, 2 ♂♂, 11 ♀♀, (A. F. Hagen). Crawford, July 31, 1962, 2 ♂♂, Aug. 14, 1962, 1 ♀, July 16, 1963, 1 ♂, June 18, 1964, 1 ♂, and July 15, 1964, 5 ♂♂, 7 ♀♀, (A. F. Hagen). *Deuel County*, Chappell, July 7, 1964, 1 ♀, and June 10, 1966, 3 ♂♂, 1 ♀, (A. F. Hagen). *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 2 ♀♀. *Kimball County*, Kimball, May 2, 1963, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Morrill County*, Bridgeport, July 3, 1964, (A. C. Scoggan), 3 ♂♂, 1 ♀. *Scotts Bluff County*, Mitchell, Aug. 12, 1915, (E. M. Partridge), 1 ♀. Scotts Bluff Experiment Station, July 21, 1962, 2 ♂♂, 1 ♀, July 25, 1962, 2 ♀♀, June 6, 1963, 1 ♂, June 23, 1964, 1 ♂, 1 ♀, and June 24, 1964, 2 ♂♂, 1 ♀, (A. F. Hagen). *Sheridan County*, Rushville, Sept. 3, 1964, (A. F. Hagen), 1 ♀. *Sioux County*, Sioux Co., June, (M. Cary), 3 ♂♂, 2 ♀♀; July, (M. A. Carriker, Jr.), 1 ♂.

### *Xanthippus corallipes latefasciatus* Scudder

*Hippiscus* (*Xanthippus*) *latefasciatus* Scudder, 1892:359—The genus *Xanthippus* was used intermittently by various workers, however, was

quite often placed as a synonym of *Hippiscus*. Hebard (1928) separated the *Hippiscus* group into seven genera: *Hippiscus*, *Pardalophora*, *Xanthippus* and four others. Hebard (1925) listed *X. corallipes latifasciatus* as occurring in Warbonnet Canyon and Glen in Sioux County. Hauke (1953) examined no specimens of this species from Nebraska. I have identified one specimen collected by M. A. Carriker, Jr., in 1901 from Cheyenne County thought to be *Pardalophora haldemanii* as *Xanthippus corallipes latifasciatus*. Hebard (1929) stated that he believed *latifasciatus* occupies all of western Nebraska. This grasshopper occurs in the same habitat as *P. haldemanii* which helps add to the confusion in identification. Three specimens have red hind wing discs. The remaining specimens have yellow wing discs.

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, 1 ♀, June 25, 1964, 3 ♂♂, and Aug. 5, 1964, 2 ♂♂, 2 ♀♀, (A. F. Hagen). *Box Butte County*, Hemingford, July 1, 1964, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, Aug. 12, 1901, (M. A. Carriker, Jr.), 1 ♀; June 10, 1966, (A. F. Hagen), 1 ♀. *Dawes County*, Chadron, April 2, 1960, 9 nymphs, May 11, 1960, 1 ♀, July 9, 1962, 1 ♀, and July 12, 1962, 2 ♂♂, 3 ♀♀, (A. F. Hagen). *Deuel County*, Chappell, June 10, 1966, (A. F. Hagen), 1 ♀. *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Kimball County*, Kimball, May 2, 1963, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Morrill County*, Bridgeport, July 3, 1964, (A. F. Hagen), 1 ♂. *Scotts Bluff County*, Scotts Bluff Experiment Station, April 27, 1962, (A. F. Hagen), 11 ♂♂, 13 ♀♀. *Sheridan County*, Bingham, July 11, 1954, (W. Burkholder), 1 ♀. *Rushville*, Sept. 3, 1964, 1 ♀, and Aug. 5, 1964, 1 ♂, (A. F. Hagen). *Sioux County*, University Lake, Aug. 25, 1965, (A. F. Hagen), 1 ♀.

## *Dissosteira carolina* (Linnaeus)

*Gryllus* (*Locusta*) *carolina* **Linnaeus, 1758:433**—This is a well-known species occurring along dusty roads and other similar habitats. It is easily recognized by the predominant black hind wing disc. With wings folded, the color varies from light tan to dark grey, offering some protective coloration. In some counties it was common while in others it was difficult to find and not plentiful when found. Brooks (1958) stated that it seems to thrive best near human habitation and is never common "in the wild." This may account for it being scarce in the more sparsely settled counties in the Panhandle.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, 2 ♀♀, and Aug. 11, 1964, 1 ♂, (A. F. Hagen). *Box Butte County*, Hemingford, Sept. 18, 1962, (A. F. Hagen), 1 ♀. *Alliance*, Sept. 27, 1967, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, Aug. 22, 1967, (A. F. Hagen), 2 ♂♂. *Dawes County*, Crawford, Aug. 15, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Deuel County*, Chappell, July 2, 1964, 1 ♀, Sept.

2, 1964, 1 ♀, and Aug. 21, 1966, 1 ♂, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 2 ♂♂. *Kimball County*, Kimball, Aug. 21, 1964, 1 ♂, and Aug. 23, 1967, 1 ♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, 1 ♀, and Aug. 21, 1967, 1 ♂, (A. F. Hagen). *Scotts Bluff County*, Mitchell, Sept. 8, 1915, (E. M. Partidge), 1 ♂; Sept. 8, 1915, (E. E. Wehr), 1 ♂. *Scotts Bluff Experiment Station*, Aug. 10, 1961, 1 ♂, July 13, 1964, 1 ♂, and July 31, 1964, 1 ♂, (A. F. Hagen). *Sheridan County*, Rushville, Aug. 24, 1964, 1 ♂, and Aug. 29, 1967, 1 ♂, (A. F. Hagen). *Sioux County*, Sioux Co., July, (M. A. Carriker, Jr.), 1 ♂, 1 ♀. *Monroe Canyon*, Aug. 23, 1908, (C. H. Gable), 1 ♂, 1 ♀.

### *Dissosteira longipennis* (Thomas)

*Oedipoda longipennis* Thomas, 1872:463—No specimens were collected during this study. Hauke (1953) states that “during recent years it has been held in check through control measures at the egg beds in areas south and southwest of Nebraska.” Wakeland (1958) reported that the abnormally wet weather in the High Plains from 1940 to 1951 was probably the main deterrent to population increase. Although the years 1951–1954 were drought years, no buildup of the species was noted. He speculates that the population was so nearly extinct that it was not capable of a buildup during those years. It is a strong flier capable of migration, and the habitats are present, yet it does not appear to exist any longer in any of the Panhandle counties.

Specimens Examined: *Cheyenne County*, Sidney, Aug. 14, 1895, (Raymond and Moffitt), 1 ♂, 1 ♀. *Deuel County*, Big Springs, August, 1896, 1 ♂, 4 ♀♀. *Sioux County*, Warbonnet Canyon, 1 ♂.

### *Spharagemon bolli bolli* Scudder

*Spharagemon bolli* Scudder, 1875:469—Hebard (1925) reported this species prefers a woodland environment. I collected specimens from seven counties where they were found in eroded canyons in pine forests, but were not numerous. It closely resembles *Spharagemon equale* (Say) but is easily separated by the presence of a pale subbasal ring followed by a black annulus on the hind tibia.

Specimens Examined: *Banner County*, Harrisburg, Aug. 23, 1967, (A. F. Hagen), 1 ♂, 1 ♀. *Box Butte County*, Alliance, Sept. 27, 1967, (A. F. Hagen), 1 ♀. *Dawes County*, Crawford, Aug. 4, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Garden County*, Oshkosh, Aug. 21, 1967, (A. F. Hagen), 2 ♂♂. *Scotts Bluff County*, Scottsbluff, Oct. 15, 1944, 1 ♂. *Gering*, Aug. 30, 1967, (A. F. Hagen), 1 ♀. *Sheridan County*, Rushville, Aug. 5, 1965, 1 ♂, 2 ♀♀, Aug. 26, 1966, 1 ♂, and Sept. 7, 1966,

2 ♂♂, (A. F. Hagen). *Sioux County*, Harrison, Aug. 29, 1966, (A. F. Hagen), 2 ♂♂.

### *Spharagemon collaris* (Scudder)

*Oedipoda collaris* Scudder, 1872:250—This species is the most common of the three species of the genus present in the Panhandle. The high median carina of the pronotum readily separates it from the other two species. Hebard (1931) referred to it as a "sand-loving insect." It was found in sandy habitats but was very common in both moist and dry rangeland.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 2 ♂♂, 3 ♀♀, and Aug. 5, 1964, 1 ♀, (A. F. Hagen). *Box Butte County*, Alliance, Aug. 14, 1937, (N. Tolman), 1 ♂; Sept. 27, 1967, (A. F. Hagen), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Dawes County*, Crawford, July 31, 1962, (A. F. Hagen), 1 ♂, 1 ♀. Chadron, Aug. 2, 1964, (A. F. Hagen), 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, 1 ♂, 1 ♀, and Aug. 22, 1967, 1 ♂, (A. F. Hagen). *Garden County*, Lewellen, Aug. 13, 1956, (L. W. Quate), 1 ♀. Oshkosh, July 7, 1964, (A. C. Scoggan), 1 ♀; Sept. 2, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Kimball County*, Kimball, Aug. 31, 1966, 2 ♂♂, and Aug. 23, 1967, 1 ♂, (A. F. Hagen). *Morrill County*, Northport, July 5, 1951, (H. A. Hauke), 2 ♀♀. Bayard, Aug. 2, 1951, (H. A. Hauke), 1 ♂. Bridgeport, Aug. 25, 1964, 1 ♂, and Aug. 31, 1964, 2 ♂♂, (A. F. Hagen). *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 30, 1960, 3 ♂♂, 3 ♀♀, Aug. 10, 1961, 4 ♂♂, 2 ♀♀, Aug. 11, 1961, 7 ♂♂, 2 ♀♀, Aug. 17, 1961, 1 ♀, Aug. 30, 1961, 2 ♂♂, 1 ♀, July 5, 1962, 3 ♀♀, July 21, 1962, 1 ♀, and July 13, 1964, 3 ♂♂, (A. F. Hagen). Morrill, July 16, 1962, (A. F. Hagen), 1 ♀. Gering, Aug. 11, 1964, (A. F. Hagen), 1 ♂. *Sheridan County*, Rushville, Sept. 3, 1964, 1 ♂, 2 ♀♀, and Aug. 26, 1966, 1 ♂, (A. F. Hagen). *Sioux County*, Glen, Aug. 7, 1905, 2 ♀♀. Agate, (H. A. Hauke), 1 ♂.

### *Spharagemon equale* (Say)

*Gryllus aequalis* Say, 1825b:307—Bruner (1897) stated that this species is widespread over the state but not numerous. This appears to be true in the Panhandle. Specimens from four counties were in the collection prior to this study. It has since been collected in all Panhandle counties. Frequently it was found associated with *Trimerotropis campestris* McNeill. Both species are similar in appearance but can be separated when disturbed. *T. campestris* makes a clicking sound in flight while *S. equale* does not. *S. equale* is a mixed feeder, however, it appears to prefer grass according to Mulkern *et al.* (1969).

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962,

11 ♂♂, 12 ♀♀, and Aug. 5, 1964, 4 ♂♂, 2 ♀♀, (A. F. Hagen). *Box Butte County*, Hemingford, Sept. 18, 1962, (A. F. Hagen), 9 ♂♂, 5 ♀♀. *Cheyenne County*, Sidney, July 29, 1960, 1 ♂, and Aug. 31, 1964, 1 ♂, 2 ♀♀, (A. F. Hagen). *Dawes County*, Crawford, July 15, 1964, 2 ♂♂, and Aug. 29, 1967, 2 ♀♀, (A. F. Hagen). *Deuel County*, Chappell, Sept. 2, 1964, 1 ♂, 1 ♀, and July 29, 1965, 3 ♂♂, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, 1 ♂, 1 ♀, and Aug. 21, 1967, 2 ♂♂, (A. F. Hagen). *Kimball County*, Bushnell, Aug. 20, 1949, (H. A. Hauke), 1 ♂. Kimball, Aug. 31, 1964, 2 ♂♂, 1 ♀, and Aug. 23, 1967, 1 ♀, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, 1 ♂, 2 ♀♀, and Aug. 21, 1967, 2 ♂♂, (A. F. Hagen). *Scotts Bluff County*, Mitchell, July 13, 1914, (L. M. Gates), 1 ♀. Scotts Bluff Experiment Station, Aug. 10, 1961, 1 ♂, 1 ♀, Aug. 11, 1961, 1 ♀, Aug. 30, 1961, 1 ♂, 1 ♀, July 5, 1962, 1 ♂, July 21, 1962, 7 ♂♂, 5 ♀♀, and Aug. 6, 1964, 1 ♂, 1 ♀, (A. F. Hagen). Gering, Aug. 11, 1964, 1 ♀, and Aug. 24, 1966, 1 ♂, (A. F. Hagen). *Sheridan County*, Gordon, 2 ♂♂. Rushville, Aug. 24, 1964, 1 ♀, Sept. 3, 1964, 1 ♀, and Aug. 29, 1967, 1 ♂, (A. F. Hagen). *Sioux County*, Glen, Aug. 7, 1908, 1 ♂, Aug. 8, 1908, 1 ♂, 1 ♀. Badlands, Aug. 10, 1908, (C. H. Gable), 1 ♀. Sioux Co., July, (M. A. Carriker, Jr.), 1 ♂, 1 ♀. Monroe Canyon, Aug. 14, 1908, (R. W. Dawson), 1 ♀; Aug. 16, 1908, 1 ♂, 2 ♀♀, Aug. 17, 1908, 2 ♂♂, Aug. 20, 1908, 1 ♀, Aug. 22, 1908, 1 ♂, 1 ♀, and Aug. 23, 1908, 1 ♀, (C. H. Gable). Mansfield, Aug. 29, 1951, (H. A. Hauke), 1 ♀. University Lake, July 31, 1964, 1 ♀, Aug. 18, 1964, 1 ♂, and Aug. 28, 1964, 1 ♂, (A. F. Hagen). Harrison, Aug. 29, 1966, (A. F. Hagen), 3 ♂♂, 3 ♀♀.

## *Derotmema haydenii haydenii* (Thomas)

*Oedipoda haydenii* Thomas, 1872:460—Bruner (1897) reported this species "quite plentiful on gravelly and sandy grounds along the Lodge Pole and Platte." In addition to the river locations reported by Bruner, it occurs in rangeland along roadways, cattle trails and eroded rangeland areas. It is not numerous in the Panhandle and is found only in the locations described. Specimens from two counties were in the collection prior to this study. I found it in the rest of the counties. This insect is one of the smallest banded-wing grasshoppers in the Panhandle. The specimens have either red or yellow hind wing discs with yellow being predominant. It is a mixed feeder but is found more often where grasses are present.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, (A. F. Hagen), 5 ♂♂, 4 ♀♀. *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂, 2 ♀♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Dawes County*, Chadron, Aug. 28, 1951, (H. A. Hauke), 4 ♂♂, 4 ♀♀. Crawford, Aug. 14, 1962, (A. F. Hagen), 1 ♂, 3 ♀♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F.

Hagen), 1 ♂, 2 ♀♀. *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 1 ♂, 2 ♀♀. *Kimball County*, Kimball, Aug. 31, 1964, 3 ♂♂, and Aug. 31, 1966, 1 ♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 2 ♀♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 10, 1961, 2 ♂♂, Aug. 11, 1961, 1 ♀, and Aug. 6, 1964, 1 ♂, 4 ♀♀, (A. F. Hagen). *Gering*, Aug. 24, 1966, (A. F. Hagen), 5 ♂♂, 7 ♀♀. *Sheridan County*, Rushville, Aug. 24, 1964, 2 ♀♀, and Sept. 3, 1964, 2 ♀♀, (A. F. Hagen). *Sioux County*, Mansfield, Aug. 29, 1951, (H. A. Hauke), 1 ♂, 1 ♀. *Harrison*, Aug. 17, 1964, (A. F. Hagen), 1 ♂, 4 ♀♀. *University Lake*, Aug. 29, 1966, (A. F. Hagen), 1 ♂.

## *Trachyrhachys kiowa kiowa* (Thomas)

*Oedipoda kiowa* **Thomas, 1872:461**—Bruner (1897) lists this species as being common in the state. This is the most abundant banded-wing grasshopper in the Panhandle. Quite often, when economic grasshopper damage occurs in rangeland, this is one of the species involved. The color of the hind wing discs on the specimens examined is variable. The majority are clear, however, a few specimens have a faint hint of yellow. Some, also, show a trace of a subapical black band.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♂, 2 ♀♀, May 14, 1964, 1 ♂, 1 ♀, Aug. 5, 1964, 1 ♀, and Aug. 23, 1967, 1 ♂, 2 ♀♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 2 ♀♀. *Hemingford*, Aug. 6, 1966, 1 ♀, and Aug. 16, 1966, 2 ♂♂, (A. F. Hagen). *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 1 ♀; Aug. 22, 1960, 1 ♀, and Aug. 22, 1967, 4 ♂♂, 1 ♀, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 7 ♂♂, 15 ♀♀. *Ft. Robinson*, July 18, 1951, (H. A. Hauke), 1 ♂. *Whitney*, July 31, 1951, (H. A. Hauke), 2 ♂♂, 1 ♀. *Chadron*, July 12, 1962, 2 ♀♀, and Aug. 4, 1966, 1 ♂, (A. F. Hagen). *Crawford*, July 31, 1962, 2 ♂♂, 1 ♀, Aug. 14, 1962, 2 ♂♂, July 16, 1963, 4 ♂♂, and July 15, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 1 ♂, 1 ♀. *Chappell*, July 10, 1953, (H. A. Hauke), 1 ♂, 4 ♀♀; Sept. 2, 1964, (A. F. Hagen), 2 ♂♂. *Garden County*, Oshkosh, July 7, 1964, (A. C. Scoggan), 2 ♂♂, 3 ♀♀; Sept. 2, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Kimball County*, Bushnell, Aug. 20, 1949, (H. A. Hauke), 1 ♀. *Kimball*, Aug. 31, 1966, 1 ♂, and Aug. 23, 1967, 3 ♂♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, 1 ♀, and Aug. 21, 1967, 1 ♂, 3 ♀♀, (A. F. Hagen). *Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 1 ♂, 1 ♀. *Mitchell*, July 9, 1914, 1 ♀, and July 13, 1914, 1 ♂, (L. M. Gates). *Scotts Bluff Experiment Station*, Aug. 30, 1960, 3 ♀♀, Aug. 10, 1961, 2 ♂♂, 1 ♀, Aug. 11, 1961, 3 ♂♂, 7 ♀♀, Aug. 17, 1961, 1 ♂, 4 ♀♀, Aug. 30, 1961, 1 ♀, and Aug. 6, 1964, 3 ♀♀, (A. F. Hagen). *Sheridan County*, Hay Springs, July 30,



1932, (A. C. Jones), 1 ♀. Niobrara River, Sept. 27, 1950, (H. A. Hauke), 2 ♂♂. Gordon, (H. A. Hauke), 6 ♂♂, 7 ♀♀. Rushville, Sept. 3, 1964, 1 ♂, 1 ♀, and Aug. 5, 1965, 1 ♀, (A. F. Hagen). *Sioux County*, Warbonnet Canyon, Aug. 22, 1947, (H. A. Hauke), 1 ♂, 2 ♀♀. Montrose, Aug. 22, 1947, (H. A. Hauke), 1 ♀. Glen, Aug. 22, 1949, (H. A. Hauke), 5 ♂♂, 5 ♀♀. Mansfield, Aug. 29, 1951, (H. A. Hauke), 2 ♂♂. University Lake, Aug. 18, 1964, 1 ♀, and Aug. 28, 1964, 1 ♀, (A. F. Hagen).

### *Trachyrhachys aspera* Scudder

*Trachyrhachis aspera* Scudder, 1876b:512—The identity of this species collected in the Panhandle caused considerable discussion between Dr. Ashley Gurney, Dr. Robert Pfadt, University of Wyoming and the author before the species determination was made. It had not previously been reported in Nebraska. Hauke (1953) speculated that it should occur in western Nebraska because it was present at Pine Bluffs, Wyo., just west of Kimball County, Neb. He also implies that it was collected near the Wyoming line in Nebraska but reported as *T. mexicana*. During this study, it was first collected in Sioux County. Since then, it has been found in all but two Panhandle counties. It is one of the latest maturing grasshopper species, usually adult the last of August through the middle of September. Nymphs were found up to the tenth of September. *T. aspera* does not appear to have the habitat range of *T. kiowa kiowa*, and was found only on short grass hill-sides; it was never numerous. The shape of the posterior angulation of the lateral lobes of the pronotum is used to separate the genera *Trachyrhachys* and *Mestobregma*. The shape of this angulation on *T. aspera* is closer to *Mestobregma* than to *Trachyrhachys*.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 3 ♂♂, 2 ♀♀. *Box Butte County*, Hemingford, Sept. 18, 1962, (A. F. Hagen), 1 ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes County*, Crawford, Aug. 26, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Garden County*, Oshkosh, Aug. 21, 1967, (A. F. Hagen), 1 ♂. *Kimball County*, Kimball, Aug. 31, 1964, 2 ♂♂, and Aug. 31, 1966, 4 ♂♂, 5 ♀♀, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, Sept. 21, 1964, (A. F. Hagen), 1 ♀. Gering, Aug. 30, 1966, (A. F. Hagen), 1 ♂. *Sioux County*, University Lake, Aug. 18, 1964, 8 ♂♂, 2 ♀♀, and Aug. 28, 1964, 10 ♂♂, 11 ♀♀, (A. F. Hagen).

### *Mestobregma plattei plattei* (Thomas)

*Oedipoda plattei* Thomas, 1873:123—Hauke (1953) listed this species from Dawes, Sioux and Scotts Bluff Counties. All of the specimens

he listed were examined during this study and identified as *Metator pardalinus* (Saussure) instead of *Mestobregma plattei plattei* as labeled. Therefore, all the specimens I examined of *Mestobregma p. plattei* from the Panhandle were collected during this study. It was found in all Panhandle counties but was rare. The predominant habitat in which it was found was short grass, sparsely vegetated clay or gravelly hillsides. Hebard (1925) stated that a small percentage of the series he examined had red hind wing discs. All the specimens I collected had yellow wing discs.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, 1 ♂, and Aug. 23, 1967, 1 ♂, 1 ♀, (A. F. Hagen). *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 3 ♀ ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes County*, Crawford, Aug. 29, 1967, (A. F. Hagen), 1 ♂, 2 ♀ ♀. *Deuel County*, Chapell, Aug. 21, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 3 ♀ ♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 6, 1964, (A. F. Hagen), 2 ♀ ♀. *Sheridan County*, Rushville, Aug. 26, 1966, (A. F. Hagen), 2 ♂ ♂, 3 ♀ ♀. *Sioux County*, University Lake, Aug. 28, 1964, 1 ♂, 2 ♀ ♀, and Aug. 24, 1966, 4 ♂ ♂, 2 ♀ ♀, (A. F. Hagen).

### *Metator pardalinus* (Saussure)

*Psinidia pardalina* Saussure, 1884:162—Bruner (1897) stated that this "is a very common species of locust that occurs over the entire state upon the prairies." He listed it under the generic name *Mestobregma*. Hebard (1925) reported that this grasshopper was "not generally present" and "often in small numbers." Specimens were collected from all counties in the Panhandle. The predominant habitat is short grass hillsides. Usually only three or four specimens were found at each collection site. Of all the species of grasshoppers in the Panhandle that possess dichromatic hind wing discs, this species has the greatest variation. The discs are either yellow or red but the various shades of these colors make an interesting comparison. The specimens in the collection vary from dark red through light pink, to dark yellow through light yellow, to almost white.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, 3 ♀ ♀, and Aug. 3, 1966, 9 ♂ ♂, 16 ♀ ♀, (A. F. Hagen). *Box Butte County*, Alliance, Sept. 3, 1964, 1 ♀, and Sept. 27, 1967, 2 ♀ ♀, (A. F. Hagen). *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 1 ♂; Aug. 22, 1966, (A. F. Hagen), 3 ♂ ♂, 2 ♀ ♀. *Dawes County*, Pine Ridge, July, 2 ♀ ♀. Chadron State Park, Nov. 10, 1954, (L. W. Quate), 1 ♂. Chadron, July 9, 1962, (A. F. Hagen), 7 ♀ ♀. Crawford, Aug. 14,

1962, 1 ♂, 4 ♀ ♀, and July 15, 1964, 2 ♂ ♂, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, Aug. 10, 1953, (H. A. Hauke), 2 ♀ ♀; Aug. 21, 1966, (A. F. Hagen), 1 ♂. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Kimball County*, Kimball, Aug. 31, 1964, 1 ♀, and Aug. 23, 1967, 1 ♂, (A. F. Hagen). *Morrill County*, Northport, Aug. 2, 1951, (H. A. Hauke), 1 ♂, 1 ♀. *Scotts Bluff County*, Gering, August, (M. A. Carriker, Jr.), 2 ♂ ♂, 2 ♀ ♀. *Scotts Bluff Experiment Station*, Aug. 30, 1960, 2 ♂ ♂, and July 6, 1962, 2 ♂ ♂, 2 ♀ ♀, (A. F. Hagen). *Sheridan County*, Rushville, Sept. 3, 1964, 1 ♀, and Aug. 29, 1967, 1 ♂, (A. F. Hagen). *Sioux County*, Sioux Co., July, (M. Cary), 1 ♀. *Harrison*, Aug. 1, 1951, (H. A. Hauke), 5 ♂ ♂, 2 ♀ ♀.

### *Trimerotropis sparsa* (Thomas)

*Oedipoda sparsa* Thomas, 1875:883—This species was found only in the badland areas of Dawes and Sioux Counties. It is numerous in these areas and often the only grasshopper species present. This species was not present in similar habitats in some of the other counties. It is not difficult to locate as the males make a noisy clattering sound in flight. This is probably a mating ritual. They were often observed hovering in the vicinity of a female when making this sound. Bruner (1893, 1897) listed this species as *Trimerotropis perplexa* Bruner. Hebard (1928) placed that specific name in synonymy. Bruner's (1889) description stated this species as "belonging to the group of non-banded-winged species." All of the specimens collected and examined show a trace of a subapical band on the hind wing. Two specimens, both males, have a distinct brownish-black band. This type of wing marking is very similar to that of *Trimerotropis cyaneipennis* Bruner. However, the tibia of *T. sparsa* are yellow while those of *T. cyaneipennis* are blue.

Specimens Examined: *Dawes County*, Chadron, July 12, 1962, (A. F. Hagen), 1 ♂. *Crawford*, Aug. 14, 1962, (A. F. Hagen), 21 ♂ ♂, 14 ♀ ♀. *Sioux County*, Harrison, Aug. 17, 1964, (A. F. Hagen), 7 ♂ ♂, 5 ♀ ♀.

### *Trimerotropis fratercula* McNeill

*Trimerotropis fratercula* McNeil, 1900:438—This species was collected in all Panhandle counties except Kimball. It will no doubt be found there eventually, at least at the extreme western edge as it occurs immediately west of Kimball County at Pine Bluffs, Wyo., which is the type locality. At the beginning of this study, I had great difficulty separating this species from *Trimerotropis pallidipennis pallidipennis* (Burmeister). Both occur in the same type of habitat, rocky or clay outcroppings in forested areas, and were usually found together. In addition, the only difference in appearance seems to be in the subapical band of the hind wing. Hebard (1929) stated of *T. fratercula* "the

wing band is distinctive, narrowing decidedly toward the spur, in that portion with margins often very irregular and frequently weakly to distinctly interrupted." He says this feature makes it closer to *Circotettix rabula rabula* Rehn and Hebard than any other species of *Trimerotropis*. The wing band on *T. pallidipennis pallidipennis* does not narrow in the vicinity of the spur and is approximately equal width throughout its length. The specimens of *T. fratercula* and *T. p. pallidipennis* examined show some variation in the features of the wing band described above. This contributed to the difficulty in identification. Final identification of many of the specimens was made by Dr. Ashley Gurney, for which I am grateful.

Specimens Examined: *Banner County*, Harrisburg, Aug. 13, 1966, 19 ♂♂, 11 ♀♀, and Aug. 31, 1966, 6 ♂♂, 7 ♀♀, (A. F. Hagen). *Box Butte County*, Alliance, Sept. 27, 1967, (A. F. Hagen), 1 ♂. Hemingford, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 22, 1967, (A. F. Hagen), 3 ♂♂, 2 ♀♀. *Dawes County*, Crawford, Aug. 4, 1966, 2 ♂♂, 2 ♀♀, and Aug. 15, 1966, 1 ♂, 4 ♀♀, (A. F. Hagen). Chadron, Aug. 4, 1966, (A. F. Hagen), 2 ♂♂, 3 ♀♀. Pine Ridge, July, 2 ♂♂, 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, 3 ♂♂, and Aug. 22, 1966, 2 ♂♂, 3 ♀♀, (A. F. Hagen). *Garden County*, Oshkosh, Aug. 23, 1966, 2 ♂♂, 1 ♀, and Aug. 28, 1966, 1 ♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 3 ♂♂, 2 ♀♀. *Scotts Bluff County*, Gering, Aug. 10, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Sheridan County*, Rushville, Sept. 7, 1966, (A. F. Hagen), 4 ♂♂, 4 ♀♀. *Sioux County*, Monroe Canyon, Aug. 12, 1908, 4 ♂♂, 2 ♀♀, and Aug. 17, 1908, 1 ♂, (L. Bruner). Hat Creek, August, 2 ♂♂. Glen, Aug. 7, 1905, 4 ♂♂, 1 ♀, and Aug. 8, 1905, 3 ♀♀.

### *Trimerotropis pallidipennis pallidipennis* (Burmeister)

*Oedipoda pallidipennis* Burmeister, 1838:641—The discussion under *T. fratercula* applies also to this species. As mentioned before, these two species usually occurred together. However, in one collection site in the Wildcat Hills in Scotts Bluff County, only *T. p. pallidipennis* was found. The specimens from this site were more uniform in the tegminal, pronotal and hind wing markings than when mixed populations were found. It appears that when mixed populations occur, cross mating may take place. Cytogenetic and interbreeding studies on these two species would aid greatly in determining if hybrids are produced. On the basis of the features of the subapical hind wing band described under *T. fratercula*, specimens identified by Hauke (1953) as *fratercula* have now been reidentified as *T. p. pallidipennis*.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 3 ♂♂, 2 ♀♀. *Cheyenne County*, Sidney, Aug. 31, 1964, 2 ♂♂, and Aug. 22, 1967, 3 ♂♂, 1 ♀, (A. F. Hagen). *Deuel County*,

Chappell, Aug. 21, 1966, 2 ♀ ♀, and Aug. 22, 1966, 2 ♂ ♂, 1 ♀, and Aug. 22, 1967, 1 ♂, (A. F. Hagen). *Garden County*, Oshkosh, Aug. 23, 1966, 1 ♀, and Aug. 21, 1967, 1 ♂, 2 ♀ ♀, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1964, 1 ♂, 1 ♀, and Aug. 23, 1967, 1 ♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 1 ♂. *Scotts Bluff County*, Gering, Aug. 10, 1966, 7 ♂ ♂, 5 ♀ ♀, and Scotts Bluff Station, Oct. 25, 1967, 3 ♂ ♂, 1 ♀, (A. F. Hagen). *Sioux County*, Harrison, Aug. 9, 1966, (A. F. Hagen), 1 ♂.

### ***Trimerotropis campestris* McNeill**

*Trimerotropis campestris* McNeill, 1900:31—This species often occurs in short grass hillsides in forested areas. The upper portion of these hillsides are usually the rocky or clay outcroppings where I found *T. fratercula* and *T. p. pallidipennis*. Therefore, the three species are often closely associated. In the counties where this type of habitat is not present, they were found on sparsely vegetated, graveled hillsides or in roadside ditches adjacent to this type of habitat. Three specimens collected prior to this study are in the collection. They are two males from Sioux County and one male from Scotts Bluff County. These were labeled *Trimerotropis monticola* McNeill. Hebard (1925) explains that this specific name is a synonym of *campestris*.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 14 ♂ ♂, 2 ♀ ♀. *Box Butte County*, Hemingford, Sept. 18, 1962, 3 ♂ ♂, and Aug. 16, 1966, 1 ♂, (A. F. Hagen). *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 2 ♂ ♂. *Dawes County*, Crawford, Aug. 22, 1966, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, Aug. 21, 1967, (A. F. Hagen), 2 ♂ ♂. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 2 ♂ ♂. *Morrill County*, Bridgeport, Aug. 22, 1966, 4 ♂ ♂, and Aug. 23, 1966, 2 ♂ ♂, (A. F. Hagen). *Scotts Bluff County*, Mitchell, July 16, 1912, (L. M. Gates), 1 ♂. Gering, Aug. 10, 1966, (A. F. Hagen), 3 ♂ ♂. *Sheridan County*, Rushville, Aug. 24, 1964, 2 ♂ ♂, 3 ♀ ♀, and Sept. 7, 1966, 2 ♂ ♂, (A. F. Hagen). *Sioux County*, Sioux Co., July, (M. A. Carriker, Jr.), 1 ♂. Glen, Aug. 17, 1905, (L. Bruner), 1 ♂. Harrison, Aug. 9, 1966, 1 ♂, 1 ♀, Aug. 29, 1966, 3 ♂ ♂, 1 ♀, and Aug. 30, 1966, 1 ♀, (A. F. Hagen).

### ***Trimerotropis agrestis* McNeill**

*Trimerotropis agrestis* McNeill, 1900:32—This grasshopper is usually found associated with gravelly intermittent stream beds. Specimens from what appears to be an isolated population of this species were collected from a wind eroded area surrounded by rangeland in Sioux County. A ten-mile square area around this site was checked and no specimens of this species were found in that area. This grasshopper has

been confused in literature with *Trimerotropis citrina* Scudder. Hebard (1931) lists *citrina* as a southeastern species found north to "central Nebraska."

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♂, Aug. 5, 1962, 2 ♂♂, 2 ♀♀, Aug. 5, 1964, 5 ♂♂, Aug. 11, 1964, 18 ♂♂, 5 ♀♀, and Aug. 31, 1966, 1 ♂, (A. F. Hagen). *Box Butte County*, Box Butte, September, 2 ♂♂. Hemingford, Aug. 26, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 3 ♂♂, 1 ♀; Aug. 22, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Dawes County*, Crawford, Aug. 15, 1966, 1 ♂, 1 ♀, and Aug. 29, 1967, 1 ♂, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 4 ♂♂, 3 ♀♀. *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 10 ♂♂. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 3 ♂♂, 3 ♀♀. *Morrill County*, Bridgeport, Aug. 25, 1964, 2 ♂♂, 1 ♀, and Aug. 21, 1967, 1 ♂, 1 ♀, (A. F. Hagen). *Scotts Bluff County*, Gering, Aug. 30, 1967, (A. F. Hagen), 1 ♂, 5 ♀♀. *Sheridan County*, Rushville, Sept. 3, 1964, 1 ♀, and Aug. 29, 1967, 1 ♂, 1 ♀, (A. F. Hagen). *Sioux County*, Harrison, Aug. 30, 1966, (A. F. Hagen), 7 ♂♂, 1 ♀.

### *Trimerotropis pistrinaria* Saussure

*Trimerotropis pistrinaria* Saussure, 1884:173—This grasshopper is one of the most numerous and widespread of the *Trimerotropis* in the Panhandle. It has a wide range of habitat from cropland to rangeland. It is usually more numerous in areas of forbs than grasses.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♂, and Aug. 5, 1964, 2 ♂♂, 4 ♀♀, (A. F. Hagen). *Box Butte County*, Alliance, Sept. 3, 1964, (A. F. Hagen), 1 ♂. Hemingford, Aug. 16, 1966, (A. F. Hagen), 4 ♂♂, 3 ♀♀. *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 2 ♂♂; July 26, 1962, (L. M. Gates), 1 ♀; Aug. 31, 1964, 2 ♂♂, 1 ♀, and July 29, 1965, 1 ♂, 2 ♀♀, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 1 ♂. Crawford, Aug. 14, 1962, 3 ♂♂, 4 ♀♀, and Aug. 15, 1966, 2 ♂♂, (A. F. Hagen). *Deuel County*, Chappell, July 29, 1965, 1 ♂, Aug. 21, 1966, 2 ♂♂, and Aug. 22, 1967, 1 ♀, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, 1 ♂, Aug. 23, 1966, 1 ♂, and Aug. 21, 1967, 2 ♂♂, 1 ♀. *Kimball County*, Kimball, Aug. 31, 1964, (A. C. Scoggan), 2 ♂♂, 1 ♀; Aug. 31, 1964, 3 ♂♂, 4 ♀♀, and Aug. 31, 1966, 2 ♂♂, 1 ♀, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Scotts Bluff County*, Gering, August, 1 ♀; Aug. 10, 1966, (A. F. Hagen), 1 ♀. Mitchell, Aug. 15, 1913, 1 ♂, and Aug. 13, 1914, 1 ♂, (L. M. Gates). *Scotts Bluff Experiment Station*, Aug. 6, 1964, 11 ♂♂, 14 ♀♀, Aug. 7, 1964, 3 ♂♂, 2 ♀♀, and Aug. 21, 1964, 10 ♂♂, (A. F. Hagen). *Sheridan County*, Rushville, Aug. 5, 1965, 3 ♂♂, 2 ♀♀, and Sept. 7, 1966,

3 ♂♂, (A. F. Hagen). *Sioux County*, Glen, Aug. 7, 1905, 1 ♂, 2 ♀♀, Aug. 8, 1905, 2 ♂♂, 3 ♀♀. University Lake, Aug. 10, 1964 (A. F. Hagen), 2 ♀♀. Harrison, Aug. 25, 1964, 1 ♂, Aug. 24, 1966, 1 ♂, and Aug. 29, 1966, 2 ♀♀, (A. F. Hagen).

### *Trimerotropis latifasciata* Scudder

*Trimerotropis latifasciata* Scudder, 1880:26—The habitats of this species are similar to *T. pistrinaria* and both species are usually found together. The specific name of this grasshopper is somewhat confused. E. M. Walker in 1910 synonymized *laticincta* under *T. latifasciata* Scudder. The usage since 1910 has been about equal between the two names. Coppock (1962) refers to *laticincta* and *latifasciata* as being two separate species. Hewitt and Barr (1967) list a species as *T. latifasciata* Scudder but does not indicate if *T. laticincta* is a synonym of their species. Newton and Gurney (1957) regarded the complex as one species with *laticincta*, as a subspecies. On the basis of this, the specimens in the collection have all been labeled *latifasciata*.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♂, and Aug. 5, 1964, 3 ♂♂, 3 ♀♀, (A. F. Hagen). *Box Butte County*, Alliance, Sept. 3, 1964, (A. F. Hagen), 2 ♂♂, 2 ♀♀. *Cheyenne County*, Sidney, Aug. 31, 1964, (A. F. Hagen), 2 ♂♂. *Dawes County*, Pine Ridge, July, 3 ♀♀. Chadron, Aug. 28, 1951, (H. A. Hauke), 3 ♂♂, 1 ♀. Crawford, Aug. 14, 1962, (A. F. Hagen), 3 ♂♂, 5 ♀♀. *Deuel County*, Chappell, Sept. 2, 1964, 10 ♂♂, 5 ♀♀, and July 29, 1965, 2 ♀♀, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 4 ♂♂. *Kimball County*, Kimball, Aug. 31, 1964, (A. C. Scoggan), 4 ♂♂, 4 ♀♀; Aug. 31, 1964, (A. F. Hagen), 1 ♀. *Morrill County*, Bridgeport, Aug. 22, 1966, 1 ♂, 2 ♀♀; and Aug. 21, 1967, 1 ♂, (A. F. Hagen). *Scotts Bluff County*, Mitchell, Aug. 9, 1915, (E. M. Partridge), 1 ♀. Scotts Bluff Experiment Station, Aug. 7, 1964, 1 ♂, 1 ♀, and Aug. 21, 1964, 3 ♂♂, (A. F. Hagen). *Sheridan County*, Rushville, Aug. 26, 1966, 2 ♂♂, 1 ♀, and Aug. 29, 1967, 2 ♂♂, (A. F. Hagen). *Sioux County*, Harrison, Aug. 17, 1964, 4 ♂♂, and Aug. 25, 1964, 2 ♂♂, 8 ♀♀, (A. F. Hagen).

### *Trimerotropis cincta* (Thomas)

*Oedipoda cincta* Thomas, 1870:80—This species was not collected during this study, although intense efforts were made to find it. The last known collection of this species in the Panhandle occurred in 1908. It is interesting to speculate that since that time some factor has changed which resulted in the demise of this species in the Panhandle.

Specimens Examined: *Sioux County*, Glen, July 8, 1905, 11 ♂♂, 4 ♀♀. *Sioux County*, Aug. 8, 1905, 1 ♂. Monroe Canyon, Aug. 24, 1908, (R. W. Dawson), 1 ♂.

## *Hadrotettix trifasciatus* (Say)

*Gryllus trifasciatus* Say, 1825b:34—This is a common species but usually not very numerous. It is one of the largest of the banded-wing grasshoppers in the Panhandle. Its size apparently makes it clumsy in movement and a very weak flier. Short grass and forb areas in rangeland are the principal habitat.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♂, and Aug. 5, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♂. *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 2 ♀ ♀; Aug. 31, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes County*, Ft. Robinson, August, 1888, 1 ♂; July 18, 1951, (H. A. Hauke), 1 ♀. Chadron, July 12, 1962, (A. F. Hagen), 3 ♀ ♀. Crawford, July 31, 1962, (A. F. Hagen), 1 ♀. *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 2 ♀ ♀. Chappell, Sept. 2, 1964, 1 ♂, 2 ♀ ♀, and July 29, 1965, 1 ♂, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, 2 ♂ ♂, and Aug. 23, 1966, 3 ♂ ♂, (A. F. Hagen). *Kimball County*, Bushnell, Aug. 20, 1949, (H. A. Hauke), 1 ♀. *Morrill County*, Northport, July 13, 1951, (H. A. Hauke), 2 ♂ ♂, 1 ♀. Bridgeport, Aug. 22, 1966, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Scotts Bluff County*, Mitchell, July 13, 1914, (L. M. Gates), 1 ♀; Aug. 8, 1923, (L. G. Worley), 1 ♂. Scotts Bluff Experiment Station, Aug. 30, 1960, 2 ♂ ♂, 7 ♀ ♀, and Aug. 6, 1964, 2 ♂ ♂, (A. F. Hagen). *Sheridan County*, Rushville, Aug. 5, 1965, (A. F. Hagen), 1 ♂. *Sioux County*, Glen, July, 1 ♂; Aug. 7, 1905, 1 ♀; Aug. 8, 1905, 2 ♀ ♀. Badlands, Aug. 10, 1908, (L. Bruner), 1 ♂. Monroe Canyon, Aug. 17, 1908, (C. H. Gable), 1 ♀. *Sioux County*, June, 2 ♂ ♂, 1 ♀ and July, 1 ♀, (M. Cary); July, (M. A. Carriker, Jr.), 2 ♀ ♀.

## *Circotettix rabula nigrafasciatus* Beamer

*Circotettix nigrafasciatus* Beamer, 1917:123—Prior to this study, specimens of this species had been collected from only Sioux and Dawes Counties. It was found in the rest of the counties during this investigation. This species was often numerous in areas of clay banks such as road cuts through hills and banks of streams. Rehn (1921) listed *nigrafasciatus* as the subspecies of *rabula* occurring in Nebraska. Brooks (1958) lists the subspecies *rabula* as occurring in Wyoming and Colorado. It is possible the latter subspecies could occur in western Nebraska also. The oldest specimen of a grasshopper from the Panhandle in the collection is a male of this species. It was collected in 1888 from Ft. Robinson, Dawes County.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, 1 ♀, and Aug. 23, 1967, 4 ♀ ♀, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♂, 1 ♀. Alliance, Aug. 11, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 12, 1901, (M. A. Carriker, Jr.), 5 ♀ ♀; Aug. 31, 1964, 2 ♂ ♂, 1 ♀, and Aug. 22, 1966, 1 ♀, (A. F.



Hagen). *Dawes County*, Ft. Robinson, August, 1888, 1 ♂. Crawford, Aug. 14, 1962, 1 ♂, and Aug. 29, 1967, 1 ♀, (A. F. Hagen). *Chadron*, Aug. 2, 1964, 1 ♂, and Aug. 4, 1966, 1 ♂, (A. F. Hagen). *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 2 ♂♂, 5 ♀♀. *Garden County*, Oshkosh, Aug. 2, 1964, 1 ♂, 1 ♀, and Aug. 21, 1967, 2 ♀♀, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1964, (A. C. Scoggan), 3 ♂♂, 2 ♀♀; Aug. 31, 1964, 1 ♂, 1 ♀, and Aug. 23, 1967, 1 ♀, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, (A. C. Scoggan), 1 ♂; Aug. 25, 1964, 2 ♀♀, and Aug. 21, 1967, 2 ♀♀, (A. F. Hagen). *Scotts Bluff County*, Gering, Aug. 11, 1964, 12 ♂♂, 39 ♀♀, and Aug. 24, 1966, 2 ♂♂, 6 ♀♀, (A. F. Hagen). *Sheridan County*, Hay Springs, Aug. 17, 1923, 1 ♀; August 24, 1964, (A. F. Hagen), 2 ♂♂. *Rushville*, Aug. 24, 1964, (A. F. Hagen), 4 ♂♂, 5 ♀♀. *Sioux County*, Sioux Co., June, 1 ♂, July, 1 ♂, (M. Cary); July (M. A. Carriker, Jr.), 1 ♂. *Monroe Canyon*, Aug. 12, 1908, (L. Bruner), 2 ♀♀; June 21, 1911, (R. W. Davison), 2 ♂♂. *Glen*, Aug. 7, 1905, 2 ♂♂, 1 ♀; Aug. 8, 1905, 3 ♂♂, 1 ♀. *Harrison*, Aug. 17, 1964, 1 ♀, and Aug. 9, 1966, 2 ♀♀, (A. F. Hagen).

## SUBFAMILY ROMALEINAE

### *Brachystola magna* (Girard)

*Brachypeplys magnus* Girard, 1853:260—A series of 15 males and 21 females is in the collection representing specimens from all Panhandle counties. It is found mostly in rangeland in either mixed grass and weed sites or pure grass sites. It was also observed in alfalfa and wheat cropland. The large size and clumsiness of this grasshopper make collection of it rather easy.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 2 ♀♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 1 ♀. *Dawes County*, Crawford, July 18, 1947, (H. A. Hauke), 2 ♂♂. *Deuel County*, Chappell, July 29, 1965, (A. F. Hagen), 1 ♀. *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 2 ♀♀. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Morrill County*, Bridgeport, Sept. 2, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Scotts Bluff County*, Mitchell, Aug. 13, 1923, (L. G. Worley), 1 ♂, 1 ♀. *Gering*, Aug. 11, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Sheridan County*, Niobrara, Sept. 27, 1950, (H. A. Hauke), 1 ♂. *Whitney*, Sept. 1, 1954, (E. W. Hamilton), 1 ♀. *Rushville*, Aug. 24, 1964, 1 ♂, and Aug. 26, 1966, 1 ♀, (A. F. Hagen). *Sioux County*, Sioux Co., July, (M. A. Carriker, Jr.), 1 ♂. *Glen*, August, 1905, 5 ♂♂, 6 ♀♀. *Monroe Canyon*, August, 1908, (R. W. Dawson), 1 ♀. *Badlands*, Aug. 10, 1908, (C. H. Gable), 1 ♀.

## SUBFAMILY CYRTACANTHACRIDINAE

### *Schistocerca lineata* Scudder

*Schistocerca lineata* Scudder, 1899b:465—Hauke (1953) states, "This insect is quite common throughout Nebraska." There are only four specimens in the collection from the Panhandle. One of these was collected in Scotts Bluff County in 1904. The other three were collected during the current study and represent only two additional counties. Hauke *loc cit* lists a specimen from Box Butte County but it was not located. Brooks (1958) records this species as feeding on *Glycyrrhiza* sp. The three collected during this investigation were from areas of mixed grasses and forbs. In 1956, I observed this species defoliating trees in a nursery at North Platte, Neb. Hubbell (1960) lists specimens from Box Butte, Cheyenne and Scotts Bluff Counties. He states that this species has the greatest range of species of the genus.

Specimens Examined: *Cheyenne County*, Sidney, Aug. 22, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, Sept. 2, 1964, (A. F. Hagen), 1 ♂. *Scotts Bluff County*, Scottsbluff, Oct. 5, 1904, 1 ♀.

### *Hypochlora alba* (Dodge)

*Pezotettix alba* Dodge, 1876:10—This species was originally described by Dodge from specimens collected in Dodge County in eastern Nebraska. Early collections established it as being present in four of the Panhandle counties. The current study established it in the rest of the counties. All 19 males and 30 females in the collection are brachypterous. In the Panhandle, this grasshopper was always collected in association with Pasture Sage *Artemisia ludoviciana* Nutt. Mulkern *et al.* (1969) reports this plant as the main food of the species.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 3 ♀♀. *Box Butte County*, Alliance, Aug. 31, 1965, (A. F. Hagen), 1 ♂. *Hemingford*, Aug. 26, 1966, (A. F. Hagen), 11 ♂♂, 6 ♀♀. *Cheyenne County*, Sidney, Aug. 12, 1901, (L. Bruner), 1 ♀; Aug. 22, 1966, (A. F. Hagen), 3 ♀♀. *Dawes County*, Pine Ridge, July, 1 ♀. *Ft. Robinson*, August, 1888, 1 ♂. *Crawford*, Aug. 29, 1967, (A. F. Hagen), 1 ♀. *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 1 ♀. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Morrill County*, Bridgeport, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Scotts Bluff County*, Mitchell, Aug. 30, 1966, (A. F. Hagen), 4 ♀♀. *Sheridan County*, Gordon, 1 ♀. *Rushville*, Sept. 3, 1964, (A. F. Hagen), 1 ♂. *Sioux County*, Glen, Aug. 8, 1905, 3 ♀♀.

## *Campylacantha olivacea olivacea* (Scudder)

*Pezotettix olivacea* Scudder, 1875c:472—Hauke (1953) suggests that this species should be found in eastern and northern parts of Nebraska. The only specimens collected in this study were from a weedy lowland pasture in Box Butte County. It was mixed with a population of *Hypochlora alba*. Both species are brachypterous and green in color and superficially resemble each other. It did not appear to be as active as *H. alba* and, when disturbed, hid rather than jumped.

Specimens Examined: *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 3 ♂♂, 3 ♀♀. *Sheridan County*, Niobrara River, Sept. 27, 1950, (H. A. Hauke), 1 ♂.

## *Aeoloplides turnbulli bruneri* (Caudell)

*Aeolopus bruneri* Caudell, 1907:134—The specimens from the Panhandle examined by Hauke (1953) were identified by Herbert S. Wallace as *Aeoloplides turnbulli bruneri* Caudell. Hauke listed them under the genus *Aeoloplus*. Wallace (1955) apparently settled the generic question by explaining the nomenclatural confusion that had occurred. He places *Aeoloplus* as a synonym of *Melanoplus*. All the specimens examined in this study appear to be *Aeoloplides turnbulli bruneri* Caudell. Wallace *loc cit* mentions that he has in his collection specimens of *A. turnbulli turnbulli* Caudell, from Sioux and Dawes Counties. The 27 males and 34 females, three of which are brachypterous, represent specimens from all Panhandle counties. This species is quite often found in association with Russian Thistle *Salsola kali* L.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 3 ♂♂, 1 ♀. *Box Butte County*, Alliance, Sept. 27, 1967, (A. F. Hagen), 2 ♂♂, 4 ♀♀. *Cheyenne County*, Sidney, July 30, 1932, (H. C. Jones), 1 ♂; Aug. 22, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes County*, Crawford, July 31, 1962, 1 ♂, 1 ♀, and Aug. 29, 1967, 2 ♂♂, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 2 ♂♂, 1 ♀. *Garden County*, Oshkosh, Sept. 2, 1964, 1 ♀, and Aug. 21, 1967, 1 ♂, 3 ♀♀, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1966, 2 ♀♀, and Aug. 23, 1967, 2 ♂♂, 1 ♀, (A. F. Hagen). *Morrill County*, Northport, July 9, 1947, (H. A. Hauke), 1 ♂, 2 ♀♀. Bayard, Aug. 2, 1951, (H. A. Hauke), 4 ♂♂, 2 ♀♀. Bridgeport, Aug. 25, 1964, (A. F. Hagen), 1 ♀. *Scotts Bluff County*, Gering, August, 1 ♀. *Scotts Bluff County*, July 22, 1948, (E. G. Burcham), 1 ♂. *Scotts Bluff Experiment Station*, Aug. 9, 1960, 2 ♀♀, Aug. 15, 1960, 1 ♀, Aug. 30, 1960, 1 ♂, 1 ♀, and Aug. 6, 1964, 1 ♂, 2 ♀♀, (A. F. Hagen). *Sheridan County*, Rushville, Sept. 3, 1964, 1 ♀, and Aug. 29, 1967, 2 ♂♂, 1 ♀, (A. F. Hagen). *Sioux County*, Agate, Aug. 20, 1951, (H. A. Hauke), 1 ♂, 4 ♀♀. *University Lake*, Aug. 13, 1965, 1 ♂, (A. F. Hagen).

## *Hesperotettix viridis viridis* (Thomas)

*Caloptenus viridis* Thomas, 1872:450—Wallace (1967) identified all specimens from the Panhandle as *H. viridis viridis*. These included those from the Panhandle previously listed by Hauke (1953), as *H. viridis pratensis* Scudder. He stated that the western edge of the *pratensis* distribution in Nebraska probably occurs on the eastern border of Lincoln County. Eighteen of the specimens he examined he considered to be atypical and probably constitute a new subspecies. He did not give the reason for this statement. Connin (1964) reported that Broom Snakeweed *Gutierrezia sarothrae* (Pursh) seemed to constitute the only food for this species in Montana. Observations and crop examination in this investigation indicate this is also true of this species in the Nebraska Panhandle. This plant occurs on sparsely vegetated rocky hillsides that are common in the Panhandle.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, (A. F. Hagen), 1 ♂, 4 ♀♀. *Box Butte County*, Alliance, Sept. 3, 1964, 2 ♀♀, and Sept. 27, 1967, 2 ♂♂, 1 ♀, (A. F. Hagen). *Cheyenne County*, Sidney, Aug. 31, 1964, 1 ♂, 1 ♀, and July 29, 1965, 1 ♀, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 2 ♀♀. *Crawford*, Sept. 4, 1962, (W. J. Hanson), 1 ♂; July 15, 1964, (A. F. Hagen), 1 ♂. *Deuel County*, Big Springs, July 29, 1932, (H. C. Jones), 2 ♀♀. *Chappell*, July 29, 1965, (A. F. Hagen), 2 ♀♀. *Garden County*, Lewellen, Aug. 14, 1951, (H. A. Hauke), 1 ♀. *Oshkosh*, July 7, 1964, (A. C. Scoggan), 1 ♀; Sept. 2, 1964, (A. F. Hagen), 1 ♂, 2 ♀♀. *Kimball County*, Kimball, Aug. 31, 1964, 2 ♀♀, and Aug. 23, 1967, 1 ♂, 1 ♀, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, (A. F. Hagen), 2 ♀♀. *Scotts Bluff County*, Mitchell, (E. E. Wehr), 1 ♀. *Scotts Bluff Experiment Station*, Aug. 30, 1960, (A. F. Hagen), 4 ♂♂, 8 ♀♀. *Sheridan County*, Whiteclay, Aug. 13, 1951, (H. A. Hauke), 1 ♀. *Rushville*, Aug. 24, 1964, 3 ♂♂, and Aug. 26, 1966, 1 ♂, (A. F. Hagen). *Sioux County*, Glen, July, (M. A. Carriker, Jr.), 2 ♀♀; Aug. 8, 1905, 1 ♂, 4 ♀♀. *Badlands*, Aug. 10, 1908, (L. Bruner), 1 ♀. *University Lake*, Aug. 10, 1964, (A. F. Hagen), 1 ♂, 3 ♀♀. *Harrison*, Aug. 29, 1966, (A. F. Hagen), 1 ♂.

## *Hesperotettix speciosus* (Scudder)

*Pezotettix speciosa* Scudder, 1872:250—Bruner (1897) mentions this species as being one that causes damage to crops. During this study I did not observe any crop damage from this species. It is not common in the Panhandle. When found, it occurs in small local weedy sites usually in association with sunflower *Helianthus* sp.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, 1 ♀, and Aug. 23, 1967, 2 ♂♂, (A. F. Hagen). *Box Butte County*,

Hemingford, Aug. 26, 1966, (A. F. Hagen), 1 ♀. *Cheyenne County*, Sidney, Aug. 31, 1964, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes County*, Crawford, July 16, 1963, 1 ♀, and Aug. 29, 1967, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, July 29, 1965, 1 ♀, and Aug. 22, 1967, 1 ♂, (A. F. Hagen). *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 1 ♀. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♂. *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Scotts Bluff County*, Gering, Aug. 11, 1964, (A. F. Hagen), 1 ♂. *Scotts Bluff Experiment Station*, Aug. 19, 1964, (A. F. Hagen), 1 ♂. *Sheridan County*, Rushville, Aug. 24, 1964, 1 ♂, and Aug. 29, 1967, 1 ♀, (A. F. Hagen). *Sioux County*, Harrison, Aug. 30, 1966, (A. F. Hagen), 1 ♂, 1 ♀.

### *Melanoplus huron* Blatchley

*Melanoplus huron* Blatchley, 1898:195—Hebard (1925) recorded this species from the Black Hills in South Dakota. He (1928) recorded it from Pine Ridge, Neb. There is only one specimen in the collection from the Nebraska Panhandle. The habitat for this species is roadsides and clearings in forested areas. No specimens of this grasshopper were collected from these areas during this study. Future collections may find it still exists in the Panhandle.

Specimens Examined: *Sioux County*, 1 ♀.

### *Melanoplus differentialis* (Thomas)

*Acridium differentiale* Thomas, 1865:450—Hauke (1953) recorded specimens from Dawes, Scotts Bluff and Sioux Counties. These specimens could not be located, therefore, all the specimens examined were collected during the present study. Its habitat is the same as the *M. bivittatus* (Say) but usually is not as abundant. This species also occurs in a melanistic form which in some areas was observed to be more numerous than the common yellow form. Both *M. differentialis* and *M. bivittatus* are victims of a common fault among collectors. The rarer species are the ones that are collected and preserved while the more common ones are merely noted as being present. This is unfortunate since even with the common species misidentification does occur and the availability of specimens would aid investigators in revisionary and other studies.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Box Butte County*, Alliance, Sept. 27, 1967, (A. F. Hagen), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, 1 ♀, Aug. 22, 1967, 2 ♂♂, (A. F. Hagen). *Dawes County*, Crawford, Aug. 29, 1967, (A. F. Hagen), 1 ♂, 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 4 ♀♀. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Kimball County*, Kimball, Aug. 31,

1964, 1 ♀, and Aug. 23, 1967, 1 ♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 25, 1964, 1 ♀, and Aug. 22, 1966, 1 ♂, (A. F. Hagen). *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 9, 1960, (A. F. Hagen), 5 ♂♂. *Sheridan County*, Rushville, Aug. 24, 1964, (A. F. Hagen), 2 ♀♀. *Sioux County*, Harrison, Aug. 29, 1967, (A. F. Hagen), 2 ♂♂.

### *Melanoplus bivittatus* (Say)

*Gryllus bivittatus* Say, 1825a:308—This and *Melanoplus differentialis* are the two most destructive species in cropland in the Panhandle. In rangeland, it is found only in areas where forbs occur. Since this grasshopper is often quite numerous in the cropland areas, it no doubt had been collected from all the counties prior to this investigation. However, until this study, it was represented in the collection by specimens from only three of the Panhandle counties. Specimens are now in the collection from all the Panhandle counties. This species occurs as an adult from late June until late September.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, 1 ♂, and Aug. 23, 1967, 2 ♂♂, 1 ♀, (A. F. Hagen). *Box Butte County*, Alliance, Aug. 31, 1965, (A. F. Hagen), 1 ♀. *Hemingford*, Aug. 16, 1966, (A. F. Hagen), 2 ♀♀. *Cheyenne County*, Sidney, Aug. 31, 1964, 1 ♂, and Aug. 22, 1967, 1 ♂, 2 ♀♀, (A. F. Hagen). *Dawes County*, Crawford, July 18, 1947, (H. A. Hauke), 2 ♂♂; July 16, 1963, 1 ♀, and July 15, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, July 29, 1965, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Kimball County*, Kimball, Aug. 31, 1964, 1 ♀, and Aug. 23, 1967, 2 ♂♂, 1 ♀, (A. F. Hagen). *Morrill County*, Bridgeport, July 3, 1964, (A. C. Scoggan), 2 ♂♂; Aug. 25, 1964, (A. F. Hagen), 1 ♀. *Scotts Bluff County*, Mitchell, Aug. 22, 1915, (E. M. Partridge), 1 ♀; Aug. 2, 1923, (M. H. Swenk), 1 ♂, 1 ♀. *Scottsbluff*, Aug. 1, 1930, (D. Nash), 1 ♂. *Scotts Bluff Experiment Station*, Aug. 9, 1960, (A. F. Hagen), 2 ♂♂, 3 ♀♀. *Sheridan County*, Rushville, Aug. 24, 1964, 1 ♀, Sept. 3, 1964, 1 ♀, and Aug. 29, 1967, 1 ♂, (A. F. Hagen). *Sioux County*, Sioux County, June, (M. Cary), 2 ♀♀. *Agate*, July 19, 1951, (H. A. Hauke), 1 ♂.

### *Melanoplus dawsoni* (Scudder)

*Pezotettix dawsoni* Scudder, 1875a:343—This brachypterous species has been found only in the counties where pine and cedar forests occur. It is found in the forests and adjacent mixed forb and grass areas. Bruner (1897) stated, "It is not rare in the state on low grounds." He may have confused this species with a species with similar appearance, *Melanoplus lakinus* (Scudder). The latter does occur in low moist areas but *M. dawsoni* was not found in this habitat.

Specimens Examined: *Banner County*, Harrisburg, Aug. 30, 1966, 1 ♂, 3 ♀♀, and Aug. 31, 1966, 3 ♀♀, (A. F. Hagen). *Box Butte County*, Alliance, Sept. 27, 1967, (A. F. Hagen), 2 ♀♀. *Cheyenne County*, Sidney, Aug. 22, 1967, (A. F. Hagen), 1 ♂, 1 ♀. *Dawes County*, Crawford, July 31, 1962, 2 ♂♂, 3 ♀♀, and Aug. 14, 1962, 16 ♂♂, 14 ♀♀, (A. F. Hagen). *Garden County*, Oshkosh, Aug. 21, 1967, (A. F. Hagen), 2 ♀♀. *Scotts Bluff County*, Gering, Aug. 30, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Sheridan County*, Rushville, Aug. 24, 1964, (A. F. Hagen), 1 ♂, 2 ♀♀. *Sioux County*, Harrison, Aug. 29, 1967, (A. F. Hagen), 2 ♂♂.

## *Melanoplus gladstoni* Scudder

*Melanoplus gladstoni* Scudder, 1897:229—This is one of the more common species of the genus in the Panhandle. It was collected in all Panhandle counties and in many of the areas it appears to be increasing in numbers. During 1964, 1965 and 1966 it caused economic damage to rangeland in Garden County. Hebard (1925) lists this species as occurring on the high prairies of western Nebraska (as *M. conspersus* Scudder). Bruner (1897) listed this species under *M. conspersus*. It feeds about equally on forbs and grasses.

Specimens Examined: *Banner County*, Harrisburg, Aug. 14, 1964, 1 ♂, and Aug. 31, 1966, 2 ♂♂, (A. F. Hagen). *Box Butte County*, Alliance, Sept. 3, 1964, 1 ♂, and Aug. 31, 1965, 2 ♂♂, (A. F. Hagen). *Hemington County*, Aug. 26, 1966, (A. F. Hagen), 9 ♂♂. *Cheyenne County*, Sidney, Aug. 31, 1964, 1 ♂, and Aug. 22, 1966, 5 ♂♂, 3 ♀♀, (A. F. Hagen). *Dawes County*, Pine Ridge, July, 2 ♂♂. *Crawford*, Aug. 15, 1966, (A. F. Hagen), 5 ♂♂. *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 3 ♂♂, 3 ♀♀. *Chappell*, Aug. 21, 1966, (A. F. Hagen), 6 ♂♂. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 8 ♂♂. *Kimball County*, Bushnell, Aug. 20, 1949, (H. A. Hauke), 1 ♀. *Kimball*, Aug. 31, 1964, 1 ♂, and Aug. 31, 1966, 2 ♂♂, (A. F. Hagen). *Morrill County*, Bridgeport, July 3, 1964, 1 ♀, and Aug. 26, 1966, 1 ♂, (A. F. Hagen). *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 21, 1960, 3 ♂♂, Aug. 30, 1960, 1 ♀, and Aug. 31, 1960, 1 ♂, (A. F. Hagen). *Gering*, Aug. 3, 1966, 2 ♂♂, 2 ♀♀, Aug. 10, 1966, 1 ♂, and Aug. 30, 1966, 1 ♂, (A. F. Hagen). *Sheridan County*, Gordon, 1 ♂, Aug. 21, 1947, (H. A. Hauke), 4 ♂♂. *Rushville*, Aug. 24, 1964, 1 ♂, Sept. 3, 1964, 2 ♂♂, and Aug. 26, 1966, 3 ♂♂, (A. F. Hagen). *Sioux County*, Glen, Aug. 22, 1949, (H. A. Hauke), 2 ♂♂, 1 ♀. *University Lake*, Aug. 18, 1964, 4 ♂♂, and Sept. 1, 1965, 3 ♂♂, (A. F. Hagen). *Harrison*, Aug. 24, 1966, 4 ♂♂, and Aug. 29, 1966, 2 ♂♂, (A. F. Hagen).

## *Melanoplus confusus* Scudder

*Melanoplus confusus* Scudder, 1897:29—This species overwinters as a nymph and is an adult early in the spring. Adults were collected from May 14 to August 15 with the majority occurring in early June. It has a wide range of habitats in the Panhandle. It was collected adjacent to the higher pine forests and in low swampy areas adjacent to rivers. This grasshopper feeds on forbs, grasses and sedges. Bruner (1897) listed this species as *M. minor* Scudder. A female in the collection from Sioux County is labeled *Mel. minor* Scudder's Type, 1895. Gurney (1969) stated that when Scudder wrote certain papers, especially the revision of the *Melanopli*, he labeled many specimens he worked with as "Scudder's Type, etc." Many of these specimens were not types, paratypes or even cotypes.

Specimens Examined: *Banner County*, Harrisburg, June 25, 1964, (A. C. Scoggan), 2 ♀ ♀; June 25, 1964, 1 ♂, and May 14, 1964, 1 ♂, 2 ♀ ♀, (A. F. Hagen). *Box Butte County*, Box Butte, July 12, 1948, (E. G. Burcham), 1 ♂. *Hemingford*, July 1, 1964, (A. C. Scoggan), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, June 30, 1964, (A. C. Scoggan), 1 ♀; Aug. 15, 1967, (A. F. Hagen), 1 ♂. *Dawes County*, Pine Ridge, July, 6 ♂ ♂, 4 ♀ ♀. *Ft. Robinson*, July 8, 1954, (L. W. Quate), 1 ♂. *Chadron*, July 12, 1962, (A. F. Hagen), 1 ♂. *Crawford*, July 16, 1963, 1 ♂, June 18, 1964, 4 ♂ ♂, 8 ♀ ♀, and July 15, 1964, 4 ♂ ♂, (A. F. Hagen). *Deuel County*, Chappell, June 10, 1966, (A. F. Hagen), 1 ♂, 3 ♀ ♀. *Garden County*, Oshkosh, June 20, 1966, (A. F. Hagen), 3 ♂ ♂, 3 ♀ ♀. *Kimball County*, Kimball, June 30, 1964, (A. C. Scoggan), 1 ♂. *Morrill County*, Bridgeport, June 25, 1965, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, June 23, 1964, 3 ♂ ♂, 1 ♀, and June 24, 1964, 1 ♂, 1 ♀, (A. F. Hagen). *Sheridan County*, Rushville, June 23, 1965, 3 ♂ ♂, 3 ♀ ♀, and June 20, 1966, 2 ♂ ♂, 2 ♀ ♀, (A. F. Hagen). *Sioux County*, Harrison, Aug. 11, 1910, (L. Bruner), 1 ♂; July 8, 1954, (L. W. Quate), 1 ♂.

## *Melanoplus femur rubrum* *femur rubrum* (De Geer)

*Acrydium femur-rubrum* De Geer, 1773:498—In many taxonomic problems associated with grasshoppers, confusion occurs with the specific name. However, in this species, the confusion is in the use of the name of the describer, Charles De Geer. Gurney (1956) presents an interesting discussion on the use of De Geer's surname and concludes that De Geer is the correct usage of the surname. As a result of his discussion, this was the way the specimens in the collection were labeled. This is one of the more common *Melanoplus* in the Panhandle. However, until this study, specimens in the collection were from only a few of the counties. Specimens are now present from all Panhandle counties. Bruner (1893) states this species as "abundant and sometimes destructive to crops."



Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, 4 ♂♂, and Aug. 23, 1967, 3 ♂♂, (A. F. Hagen). *Box Butte County*, Alliance, Aug. 31, 1965, (A. F. Hagen), 2 ♂♂, 1 ♀. Hemingford, Aug. 26, 1966, (A. F. Hagen), 7 ♂♂. *Cheyenne County*, Sidney, Aug. 31, 1964, 1 ♀, Aug. 22, 1966, 1 ♂, and Aug. 22, 1967, 7 ♂♂, (A. F. Hagen). *Dawes County*, Crawford, July 15, 1964, 1 ♂, and Aug. 15, 1966, 5 ♂♂, (A. F. Hagen). *Deuel County*, Big Springs, July 29, 1932, (H. C. Jones), 1 ♀; Sept. 26, 1950, (H. A. Hauke), 1 ♂. Chappell, Aug. 22, 1967, (A. F. Hagen), 6 ♂♂. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 3 ♂♂. *Kimball County*, Kimball, Aug. 31, 1964, 2 ♂♂, Aug. 31, 1966, 1 ♂, and Aug. 23, 1967, 6 ♂♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 17 ♂♂. *Scotts Bluff County*, Mitchell, Aug. 9, 1915, (E. M. Partridge), 1 ♀. Scotts Bluff Experiment Station, Aug. 9, 1960, 10 ♂♂, 2 ♀♀, Aug. 19, 1964, 3 ♂♂, and Aug. 31, 1964, 6 ♂♂, (A. F. Hagen); Aug. 31, 1964, (A. C. Scoggan), 4 ♂♂. *Sheridan County*, Niobrara River, Sept. 27, 1950, 3 ♂♂, 1 ♀. Rushville, Aug. 24, 1964, 1 ♂, Aug. 5, 1965, 2 ♂♂, Aug. 26, 1966, 15 ♂♂, and Sept. 7, 1966, 3 ♂♂, (A. F. Hagen). *Sioux County*, Sioux County, July, (M. Cary), 2 ♂♂, 1 ♀. University Lake, Aug. 24, 1966, 1 ♂, and Aug. 29, 1966, 1 ♂, (A. F. Hagen). Harrison, Aug. 29, 1966, (A. F. Hagen), 1 ♂.

## *Melanoplus infantilis* Scudder

*Melanoplus infantilis* Scudder 1879:65—This is the smallest of the winged species of *Melanoplus* found in the Panhandle. It has a habit of hiding rather than jumping when disturbed and is dull grey in color. This may be one of the reasons specimens from only four of the Panhandle counties were in the collection prior to this investigation. Specimens, 37 males and 14 females, are now in the collection from all counties in the Panhandle. Brooks (1958) records it as being a "mixed feeder preferring grasses." In the Panhandle, it occurs in the rangeland more often than cropland. Adults occur in August and September.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, 1 ♂, 1 ♀, and Aug. 23, 1967, 1 ♂, (A. F. Hagen). *Box Butte County*, Box Butte, September, 1 ♀. Hemingford, Aug. 11, 1951, (H. A. Hauke), 3 ♂♂, 5 ♀♀; Aug. 26, 1966, (A. F. Hagen), 4 ♂♂. Alliance, Sept. 3, 1964, (A. F. Hagen), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 2 ♂♂. *Dawes County*, Crawford, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Kimball County*, Dix, Aug. 19, 1949, (H. A. Hauke), 2 ♀♀. Kimball, Aug. 31, 1964, (A. C. Scoggan), 1 ♂; Aug. 31, 1964, 1 ♂, and Aug. 31, 1966, 2 ♂♂, (A. F. Hagen). *Morrill County*, Redington, Aug. 10, 1951, (H. A. Hauke), 1 ♂, 1 ♀. *Scotts Bluff County*, Gering, Aug. 10, 1966, 1 ♂, and Aug. 30, 1966, 5 ♂♂, 1 ♀, (A. F. Hagen). *Sheridan*

County, Rushville, Aug. 5, 1965, (A. F. Hagen), 2 ♂♂. *Sioux County*, Glen, Aug. 22, 1949, 1 ♂, 1 ♀. Agate, Aug. 21, 1949, 4 ♂♂, and Aug. 1, 1951, 1 ♂, (H. A. Hauke). University Lake, Aug. 10, 1964, (A. F. Hagen), 1 ♂.

### *Melanoplus lakinus* (Scudder)

*Pezotettix lakinus* Scudder, 1897:124—In the collection from Nebraska, Hauke (1953) examined no specimens listed from the Panhandle. We found one male and two females collected from Garden County in 1953. The rest of the specimens were obtained during the current study and represent collections from all Panhandle counties. All specimens except one male from Banner County are brachypterous. The wings of this male extend slightly beyond the tip of the abdomen. This species is quite common in the Panhandle, occurring in weedy roadside borrow pits. These areas were usually adjacent to alfalfa fields. Although all the specimens were collected in August, adults were observed in late July and through September.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, 2 ♂♂, and Aug. 23, 1967, 1 ♂, 2 ♀♀, (A. F. Hagen). *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂. *Alliance*, Sept. 27, 1967, (A. F. Hagen), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 31, 1964, 1 ♂, and Aug. 22, 1966, 2 ♂♂, (A. F. Hagen). *Dawes County*, Crawford, Aug. 26, 1966, 2 ♂♂, and Aug. 29, 1967, 2 ♂♂, (A. F. Hagen). *Deuel County*, Chappell, Sept. 2, 1964, 1 ♂, Aug. 21, 1966, 1 ♂, and Aug. 22, 1967, 2 ♂♂, (A. F. Hagen). *Garden County*, Oshkosh, Aug. 16, 1953, (H. A. Hauke), 1 ♂, 2 ♀♀; Aug. 23, 1966, (A. F. Hagen), 2 ♂♂. *Kimball County*, Kimball, Aug. 31, 1966, 2 ♂♂, and Aug. 23, 1967, 4 ♂♂, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 9 ♂♂. *Scotts Bluff County*, Mitchell, Aug. 30, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Gering*, Aug. 30, 1967, (A. F. Hagen), 4 ♂♂, 2 ♀♀. *Sheridan County*, Rushville, Aug. 26, 1966, 2 ♂♂, and Aug. 29, 1967, 2 ♂♂, 1 ♀, (A. F. Hagen). *Sioux County*, Harrison, Aug. 30, 1966, 2 ♂♂, and Aug. 29, 1967, 2 ♂♂, (A. F. Hagen).

### *Melanoplus occidentalis occidentalis* (Thomas)

*Caloptenus occidentalis* Thomas, 1872:453—Bruner (1893, 1897) lists this species both as *M. occidentalis* (Thomas) and as a synonym *M. flabellifer* Scudder. He states that this occurs in the "middle and western portions of the state and is not at all common." Hebard (1932) lists this species as capable of living in a very rigorous environment. It is present throughout the Panhandle. I found it in eight counties, usually in weedy borrow pits along gravel or dirt roads. It was never very numerous at these sites. Brooks (1958) lists this species as a mixed-feeder. In our collection sites, only forbs were present. Grass was usually adjacent to these sites.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂. *Box Butte County*, Box Butte, July 11, 1954, (H. A. Hauke), 1 ♂. Hemingford, Aug. 16, 1966, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 1 ♂. *Dawes County*, Ft. Robinson, Sept. 5, 1962, 1 ♀. Chadron, July 12, 1962, (A. F. Hagen), 2 ♂♂, 1 ♀. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 1 ♂. *Garden County*, Oshkosh, Aug. 23, 1966, 1 ♂, and Aug. 21, 1967, 1 ♂, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♂. *Morrill County*, Bridgeport, July 3, 1964, (A. C. Scoggan), 2 ♀♀. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 30, 1960, 2 ♂♂, 1 ♀, and Aug. 6, 1964, 2 ♂♂, (A. F. Hagen). Gering, Aug. 10, 1966, (A. F. Hagen), 1 ♂. *Sheridan County*, Rushville, Aug. 26, 1966, (A. F. Hagen), 1 ♂. *Sioux County*, Harrison, Aug. 18, 1963, (D. W. Ribble), 1 ♂; Aug. 29, 1966, (A. F. Hagen), 8 ♂♂.

### *Melanoplus sanguinipes* (Fabricus)

*Gryllus sanguinipes* Fabricus, 1798:195—This species since its discovery has been known by many specific names. First as *M. atlantis*, then from about 1917 to 1958, as *M. mexicanus* (Sauss) and from 1958 to 1962 as *M. bilituratus* (Walker). Gurney (1962) explains the synonym of this species and shows that *M. atlantis* and *M. bilituratus* are synonyms of *M. sanguinipes* (Fabricus). *M. mexicanus*, although used for this species, is not a synonym but a valid name for a species occurring in Mexico and western Texas. He lists three subspecies, *sanguinipes*, *vulturinus* and *defectus*. The latter two are southern subspecies, therefore, it appears the subspecies in Nebraska is *sanguinipes*. Shotwell (1941) lists a partial second generation occurring in Nebraska in 1936. Hauke (1953) lists one specimen he examined from Sioux County as a gynadromorph.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, 2 ♂♂, and Aug. 31, 1966, 5 ♂♂, (A. F. Hagen). *Box Butte County*, Hemingford, Aug. 6, 1947, (H. A. Hauke), 6 ♂♂. Alliance, Sept. 3, 1964, (A. F. Hagen), 1 ♂. *Cheyenne County*, Gurley, July 12, 1954, (E. W. Hamilton), 1 ♂. Sidney, June 30, 1964, (A. C. Scoggan), 1 ♀; Aug. 31, 1964, (A. F. Hagen), 2 ♂♂, 1 ♀. *Dawes County*, Pine Ridge, July, 5 ♂♂. Chadron, July 10, 1954, (L. W. Quate), 1 ♀; July 12, 1962, (A. F. Hagen), 3 ♀♀. Crawford, July 18, 1947, (H. A. Hauke), 2 ♂♂, 3 ♀♀; July 31, 1962, 7 ♂♂, Aug. 14, 1962, 2 ♂♂, July 16, 1963, 6 ♂♂, 6 ♀♀, July 13, 1964, 3 ♂♂, July 15, 1964, 2 ♂♂, and July 31, 1964, 5 ♂♂, (A. F. Hagen). *Deuel County*, Chappell, July 7, 1964, (A. C. Scoggan), 2 ♀♀; Sept. 2, 1964, (A. F. Hagen), 4 ♂♂. *Garden County*, Oshkosh, July 7, 1964, (A. C. Scoggan), 2 ♂♂, 2 ♀♀; Sept. 2, 1964, (A. F. Hagen), 2 ♂♂. *Kimball County*, Kimball, Aug. 31, 1964, 2 ♂♂, and Aug. 23, 1967, 4 ♂♂, (A. F. Hagen). *Morrill County*,

Bayard, Aug. 22, 1951, (H. A. Hauke), 1 ♂. Bridgeport, July 3, 1964, (A. C. Scoggan), 1 ♂, 1 ♀; Aug. 25, 1964, 2 ♂♂, and Aug. 22, 1966, 4 ♂♂, (A. F. Hagen). *Scotts Bluff County*, Mitchell, July 19, 1913, (L. M. Gates), 1 ♂; Aug. 11, 1915, (E. M. Partridge), 1 ♂; Aug. 2, 1923, (H. M. Swenk), 1 ♂. *Scotts Bluff Experiment Station*, Aug. 9, 1960, 1 ♂, 3 ♀♀, Aug. 30, 1960, 3 ♂♂, 5 ♀♀, Aug. 31, 1960, 2 ♀♀, June 24, 1964, 2 ♂♂, 3 ♀♀, (A. F. Hagen). *Sheridan County*, Gordon, 1 ♂, 1 ♀. Rushville, Aug. 29, 1967, (A. F. Hagen), 2 ♂♂. *Sioux County*, Glen, Aug. 7, 1905, 1 ♂. *Monroe Canyon*, Aug. 24, 1908, (R. W. Dawson), 1 ♂. *Montrose*, Aug. 22, 1947, (H. A. Hauke), 2 ♂♂. *Harrison*, July 8, 1954, (L. W. Quate), 1 ♀; Aug. 18, 1963, (D. W. Ribble), 1 ♂. *Wood Reserve*, Ft. Robinson, Aug. 29, 1959, 2 ♀♀.

### *Melanoplus keeleri luridus* (Dodge)

*Caloptenus luridus* Dodge, 1876:11—It appears that Bruner (1893, 1897) refers to this species as *Melanoplus luridus* Dodge. He, as well as Hauke (1953), states that it is common over most of the state. Hebard (1929) reports that this species was reported from Colorado as *luridus* also. It is not a common grasshopper in the Panhandle. Specimens from Dawes and Scotts Bluff Counties were in the collection prior to this study. I was able to find it in the other Panhandle counties but in very small numbers. It was usually found in dry short grass areas often adjacent to woodlands.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, (A. F. Hagen), 1 ♂. *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 2 ♂♂. *Dawes County*, Ft. Robinson, August, 1888, 1 ♂. *Crawford*, Aug. 29, 1967, (A. F. Hagen), 1 ♂. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 1 ♂. *Garden County*, Oshkosh, Aug. 23, 1966, (A. F. Hagen), 2 ♂♂. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 3 ♂♂. *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 2 ♂♂. *Scotts Bluff County*, Scottsbluff, Oct. 5, 1904, 2 ♂♂, 3 ♀♀. *Sheridan County*, Rushville, Sept. 3, 1964, 1 ♂, August 5, 1965, 1 ♂, and Sept. 7, 1966, 4 ♂♂, (A. F. Hagen). *Sioux County*, Harrison, Aug. 30, 1966, (A. F. Hagen), 2 ♂♂.

### *Melanoplus packardii* Scudder

*Melanoplus packardii* Scudder, 1878:288—The discussion under *M. foedus* mentions the problems on identification of this species and *M. foedus*. A cytogenetic study may help to answer some of the taxonomic problems between these two species. *M. packardii* occurs throughout the Panhandle, usually in weedy rangeland areas sometimes adjacent to woodlands. It is also found in cultivated areas adjacent to rangeland. A female specimen from Dawes County, Pine Ridge, is labeled "*Mel packardii* Scudder's Type 1895."

Specimens Examined: *Banner County*, Harrisburg, May 14, 1964, (A. F. Hagen), 3 ♂♂, 1 ♀. *Box Butte County*, Alliance, Sept. 3, 1964, (A. F. Hagen), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 31, 1964, (A. F. Hagen), 2 ♂♂. *Dawes County*, Pine Ridge, July, 1 ♂, 1 ♀. Crawford, July 16, 1963, (A. F. Hagen), 1 ♀. *Deuel County*, Chappell, July 29, 1965, (A. F. Hagen), 1 ♂, 1 ♀. *Garden County*, Oshkosh, July 7, 1964, (A. C. Scoggan), 3 ♂♂; July 7, 1964, 1 ♀, and Sept. 2, 1964, 1 ♂, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1964, (A. F. Hagen), 1 ♂. *Morrill County*, Northport, July 9, 1947, (H. A. Hauke), 1 ♂. Bridgeport, Aug. 25, 1964, (A. F. Hagen), 2 ♂♂. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 30, 1960, 7 ♂♂, 11 ♀♀, and Aug. 31, 1960, 3 ♂♂, 2 ♀♀, (A. F. Hagen). *Sheridan County*, Rushville, Sept. 3, 1964, (A. F. Hagen), 2 ♂♂. *Sioux County*, Sioux Co., June, (M. Cary), 2 ♀♀; July, (M. A. Carriker, Jr.), 1 ♀. Monroe Canyon, Aug. 20, 1908, (C. H. Gable), 2 ♀♀.

## *Melanoplus foedus* Scudder

*Melanoplus foedus* Scudder, 1879:69—The examination of the aedeagus appears to be the only way to separate the males of this species from those of *Melanoplus packardii*. No reliable way is known to separate the females of the two species. The females listed below were found in copulation or close association and assumed to be *M. foedus*. Brooks (1958) shows slightly more constriction in the middle of the cerci of *foedus* than *packardii*. This does not appear to be a good characteristic to separate the species. Our series shows variations in this constriction even within a species.

When we compared our series of *foedus* with the series of *packardii*, we noted that the tibia of most of the *foedus* are blue while those of *packardii* are pink to red in color. However, this does not hold true for all specimens and cannot be used as a definite separation characteristic. Based on Brooks *loc cit* key to the subspecies of *foedus*, our series appear to contain specimens of *M. foedus foedus* and *M. foedus fluviatilis* Bruner.

However, further work is needed on the differences between the subspecies before they can be definitely separated. His distribution list of the subspecies places both of these in Nebraska. This grasshopper does not appear to be as numerous in the Panhandle as does its allied species *M. packardii*. In the Pine Ridge on grass covered ridges, pure populations of *M. foedus* were found while at the lower elevations they were quite often mixed with *M. packardii*.

Specimens Examined: *Banner County*, Harrisburg, Aug. 23, 1967, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, Aug. 31, 1964, (A. F. Hagen), 1 ♂. *Dawes County*, Chadron, July 12, 1962, (A. F. Hagen), 1 ♀. Crawford, July 15, 1964, (A. F. Hagen), 2 ♂♂. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 1 ♂. *Garden County*, Oshkosh,

Aug. 21, 1967, (A. F. Hagen), 1 ♂, 2 ♀ ♀. *Morrill County*, Bayard, July 9, 1947, (H. A. Hauke), 2 ♂ ♂, 2 ♀ ♀. *Northport*, July 9, 1947, (H. A. Hauke), 1 ♂. *Scotts Bluff County*, Gering, Aug. 30, 1967, (A. F. Hagen), 2 ♀ ♀. *Sheridan County*, Rushville, Sept. 3, 1964, (A. F. Hagen), 3 ♂ ♂, 1 ♀. *Sioux County*, Harrison, Aug. 29, 1967, (A. F. Hagen), 2 ♀ ♀.

### *Melanoplus angustipennis* (Dodge)

*Caloptenus angustipennis* Dodge, 1877:111—The original description of this species by Dodge was from a specimen collected near the Elkhorn River in Dodge County, Neb. A synonym *M. compactus* Scudder was described in 1897 from specimens collected at Sidney, Cheyenne County, Neb. This species has continuous distribution in the Panhandle but was never found in large numbers. Brooks (1958) lists this species as a mixed feeder preferring grasses. Contents from 56 specimens I conducted crop examination on, contained mostly grass with few forbs being present.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, (A. F. Hagen), 1 ♂. *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 1 ♂, 1 ♀. *Cheyenne County*, Sidney, Aug. 22, 1966, (A. F. Hagen), 1 ♂. *Dawes County*, Pine Ridge, July, 1 ♂. *Crawford*, Aug. 29, 1967, (A. F. Hagen), 1 ♂. *Deuel County*, Big Springs, Sept. 26, 1950, (H. A. Hauke), 1 ♂. *Chappell*, Aug. 21, 1966, (A. F. Hagen), 2 ♂ ♂, 1 ♀. *Garden County*, Oshkosh, Aug. 16, 1953, (H. A. Hauke), 1 ♂; Sept. 2, 1964, (A. F. Hagen), 3 ♂ ♂. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 1 ♂. *Morrill County*, Bayard, July 9, 1947, (H. A. Hauke), 1 ♀. *Bridgeport*, Aug. 22, 1966, (A. F. Hagen), 1 ♂. *Scotts Bluff County*, Mitchell, (E. E. Wehr), 1 ♂. *Scottsbluff*, Oct. 5, 1904, 1 ♂. *Scotts Bluff Experiment Station*, Aug. 30, 1960, (A. F. Hagen), 3 ♂ ♂, 1 ♀. *Sheridan County*, Rushville, Aug. 24, 1964, 2 ♂ ♂, and Sept. 3, 1964, 3 ♂ ♂, (A. F. Hagen). *Sioux County*, Sioux Co., July, (M. A. Carriker, Jr.), 1 ♀. *Harrison*, Aug. 24, 1966, (A. F. Hagen), 4 ♂ ♂.

### *Melanoplus bowditchi canus* Hebard

*Melanoplus bowditchi canus* Hebard, 1925:120—A great deal of taxonomic confusion surrounds this species and *Melanoplus flavidus* Scudder. Hebard (1925) described *M. bowditchi canus*. In the same publication on the subject of separation of this and *M. flavidus*, he states in Nebraska and South Dakota assignment of material is decidedly difficult. Brooks (1958) in his discussion of *M. flavidus* supports Hebard's statement. Thompson (1959) in his key separates the two species on the basis of absence or presence of streaks on the tegmina and the degree of intensity of the bars on the femora.

Brooks (1958) separates them by shape of the aedeagus. Our identifications were based on Brooks' descriptions of the aedeagus. The series in the collection show too much variability of Thompson's characteristics within the species to make them reliable. Hebard (1925), Ball *et al.* (1942) and Brooks (1958) state that *M. bowditchi canus* is a sagebrush *Artemisia* sp. feeder. Our specimens were all collected from sagebrush. The male specimens that were available, previously described by Hauke (1953), as *M. flavidus flavidus* from the Panhandle, were reidentified as *M. bowditchi canus* on the basis of the shape of the aedeagus.

Specimens Examined: *Banner County*, Harrisburg, Aug. 5, 1964, (A. F. Hagen), 1 ♂. *Box Butte County*, Hemingford, Aug. 26, 1966, (A. F. Hagen), 1 ♂. *Cheyenne County*, Sidney, July 25, 1962, (A. F. Hagen), 1 ♂. *Dawes County*, Crawford, Aug. 26, 1966, (A. F. Hagen), 2 ♂♂. *Deuel County*, Chappell, Aug. 21, 1966, (A. F. Hagen), 3 ♂♂. *Garden County*, Oshkosh, Aug. 16, 1953, (H. A. Hauke), 1 ♂, 1 ♀; Sept. 2, 1964, (A. F. Hagen), 2 ♂♂. *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 2 ♂♂. *Morrill County*, Bridgeport, Aug. 22, 1966, (A. F. Hagen), 7 ♂♂. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 30, 1960, (A. F. Hagen), 1 ♂. *Sheridan County*, Niobrara River, Sept. 27, 1950, (H. A. Hauke), 1 ♀. *Sioux County*, Sioux Co., July, (M. A. Carriker, Jr.), 1 ♂. Harrison, Aug. 24, 1966, 2 ♂♂, and Aug. 29, 1966, 3 ♂♂, (A. F. Hagen).

Specimens Examined: (Previously listed as *Melanoplus flavidus flavidus* Scudder) *Cheyenne County*, Sidney, 1 ♂; Aug. 12, 1901, (L. Bruner), 1 ♂. *Deuel County*, Big Springs, July 29, 1932, (H. C. Jones), 1 ♂, 1 ♀. *Sioux County*, Glen, Aug. 8, 1905, 2 ♀♀.

### *Phoetaliotes nebrascensis* (Thomas)

*Pezotetti nebrascensis* Thomas, 1872:455—This species is normally brachypterous. Three of the males in the collection have wings that extend slightly beyond the abdomen. This grasshopper feeds primarily on grass and occurs throughout the rangeland in the Panhandle. The adults are present from July to September.

Specimens Examined: *Banner County*, Harrisburg, Aug. 31, 1966, (A. F. Hagen), 1 ♂, 2 ♀♀. *Box Butte County*, Alliance, Sept. 3, 1964, (A. F. Hagen), 4 ♂♂, 1 ♀. Hemingford, Aug. 26, 1966, (A. F. Hagen), 4 ♂♂. *Cheyenne County*, Sidney, Aug. 31, 1964, (A. F. Hagen), 2 ♂♂. *Dawes County*, Crawford, July 31, 1962, 2 ♂♂, Aug. 14, 1962, 1 ♂, Aug. 8, 1963, 1 ♂, and Aug. 15, 1966, 5 ♂♂, 1 ♀, (A. F. Hagen). *Deuel County*, Chappell, Sept. 2, 1964, (A. F. Hagen), 2 ♂♂. *Garden County*, Oshkosh, Sept. 2, 1964, 2 ♂♂, 1 ♀, and Aug. 23, 1966, 2 ♂♂, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1964, 1 ♀, and Aug. 23, 1967, 2 ♀♀, (A. F. Hagen). *Morrill County*, Bridgeport, Aug. 22,

1966, (A. F. Hagen), 2 ♂♂. *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 19, 1964, (A. F. Hagen), 1 ♀. Gering, Aug. 3, 1966, 1 ♂, 2 ♀♀, and Aug. 24, 1966, 6 ♂♂, 4 ♀♀, (A. F. Hagen). *Sheridan County*, Rushville, Aug. 24, 1964, 2 ♂♂, and Sept. 3, 1964, 4 ♂♂, 5 ♀♀, (A. F. Hagen). *Sioux County*, Montrose, Aug. 22, 1947, (H. A. Hauke), 1 ♂, 2 ♀♀. Glen, Aug. 22, 1949, 1 ♀. Woods Reserve, Ft. Robinson, Aug. 29, 1959, 2 ♂♂, 2 ♀♀. University Lake, Sept. 1, 1965, (A. F. Hagen), 1 ♂.

### *Dactylotum bicolor pictum* (Thomas)

*Pezotettix picta* Thomas, 1870:78—Hebard (1925) records this species from middle and western Nebraska. Specimens were in the collection from four of the Panhandle counties when this study began. I collected it in the other counties. Usually, only two or three specimens were found at a site. All the specimens are brachypterous. The tegmina are neither attingent nor overlapping but their mesal (dorsal) margins are separated by a portion of the dorsum. In most brachypterous species, the tegmina touch somewhere along the mesal margins. This is the most colorful species of grasshopper found in the Panhandle.

Specimens Examined: *Banner County*, Harrisburg, Aug. 3, 1962, (A. F. Hagen), 5 ♂♂, 5 ♀♀. *Box Butte County*, Box Butte, September, 1 ♂; July 18, 1948, (E. G. Burcham), 2 ♂♂. *Cheyenne County*, Sidney, Aug. 12, 1901, (M. A. Carriker, Jr.), 3 ♂♂, 3 ♀♀; Aug. 31, 1964, (A. F. Hagen), 1 ♂. *Dawes County*, Pine Ridge, July, 1 ♂. Crawford, Aug. 29, 1967, (A. F. Hagen), 1 ♂, 1 ♀. *Deuel County*, Chappell, Sept. 2, 1964, 1 ♂, and Aug. 22, 1967, 2 ♀♀, (A. F. Hagen). *Garden County*, Oshkosh, Sept. 2, 1964, 1 ♀, and Aug. 23, 1966, 2 ♀♀, (A. F. Hagen). *Kimball County*, Kimball, Aug. 31, 1966, (A. F. Hagen), 2 ♀♀. *Morrill County*, Bridgeport, Aug. 22, 1966, 1 ♂, and Aug. 21, 1967, 1 ♀, (A. F. Hagen). *Scotts Bluff County*, Scotts Bluff Experiment Station, Aug. 31, 1960, (A. F. Hagen), 2 ♀♀. *Sheridan County*, Rushville, Aug. 26, 1966, 1 ♂, and Aug. 29, 1967, 2 ♂♂, (A. F. Hagen). *Sioux County*, Glen, Aug. 15, 1905, 2 ♂♂, 1 ♀. Warbonnet Canyon, Aug. 12, 1908, (J. T. Zimmer), 1 ♀. Monroe Canyon, Sept. 3, 1921, (R. E. Weir), 1 ♂.



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